

5. Attached hereto as Exhibit D is a true and accurate copy of Ocean Spray's Supplemental Answer to Interrogatory 4 dated November 11, 2005.

6. Attached hereto as Exhibit E is a true and correct copy of a letter dated October 4, 2005 from Todd Werner to William Woodford.

7. Attached hereto as Exhibit F is a true and correct copy of Amazin' Raisins Motion to Compel filed on October 27, 2005.

8. Attached hereto as Exhibit G is a true and accurate copy of the November 10, 2005 Motion for Extension of Time.

9. Attached hereto as Exhibit H is a true and accurate copy of a December 16, 2005 e-mail to Todd Werner from William Woodford.

10. Attached hereto as Exhibit I is a true and accurate copy of the December 27, 2005 Motion to Withdraw.

11. Attached hereto as Exhibit J is a true and accurate copies of excerpts from the April 10, 2006 deposition of Keith Cadwallader.

12. Attached hereto as Exhibit K is a true and accurate copy of the November 17, 2005 Joint Motion to Amend Scheduling Order.

13. Attached hereto as Exhibit L are true and accurate copies of excerpts from the December 15, 2005 Deposition of Michael Scott

14. Attached hereto as Exhibit M are true and accurate copies of excerpts from the June 6 2006 Deposition of Jack Mazin.

15. Attached hereto as Exhibit N is a true and accurate copy of a March 22, 2006 e-mail from Michael Zeligler to Christopher Sorenson.

16. Attached hereto as Exhibit O is a true and accurate copy of an October 19, 2006 e-

mail from Christopher Sorenson to Michael Zeliger.

17. Attached hereto as Exhibit P is a true and accurate copy of a Notice of Deposition for Keith Cadwallader.

18. Attached hereto as Exhibit Q is a true and accurate copy of a Notice of Deposition for Amir Lalji.

19. Attached hereto as Exhibit R is a true and accurate copy of a Notice of Deposition for Jack Mazin.

20. Attached hereto as Exhibit S is a true and accurate copy of Polaroid Corp. v. Eastman Kodak Co., No. 76-1634-MA, 1990 U.S. Dist. LEXIS 17968.

I declare under the penalty of perjury that the foregoing is true and accurate.

Executed on this 28th day of September 2007.

s/Christopher J. Sorenson
Christopher J. Sorenson

FISH & RICHARDSON P.C.,P.A.

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December 17, 2003

Douglas J. Williams, Esq.
Merchant & Gould
3200 IDS Center
Minneapolis, MN 55402-2215

Re: Ocean Spray Cranberries, Inc.

Dear Mr. Williams:

We are writing in regard to your request for samples of decharacterized fruit pieces. After considering the matter, we are of the opinion that production of such samples is neither practical nor necessary. Our letter of June 19, 2003 adequately sets out the basis for our non-infringement position.


We also continue to question whether the '861 patent is valid and enforceable. According to the prosecution history of the '861 patent, the patent application was abandoned for failure to pay the issue fee. The applicant revived the application, claiming he unintentionally abandoned it due to lack of funds. A deliberate decision to abandon an application due to lack of funds is not unintentional abandonment. Neither of your letters addressed this issue.

Very truly yours,


Dorothy P. Whelan

cc: Alana Sharenow, Esq.

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W.K. Richardson
1859-1951

March 5, 2004

Douglas J. Williams, Esq.
Merchant & Gould
3200 IDS Center
Minneapolis, MN 55402-2215

Re: Ocean Spray Cranberries, Inc.

Dear Mr. Williams:

We are writing in response to your letter of February 26, 2004. Our decision not to produce decharacterized fruit pieces is in no way an admission that we agree with your infringement claim. As noted in previous correspondence, we are of the opinion that production of such samples is neither practical nor necessary.

We further note that any discussion of infringement is premature until issues regarding the enforceability and validity of the '861 patent are resolved. Specifically, the prosecution history of the '861 patent demonstrates that the patent application was abandoned for failure to pay the issue fee. The applicant revived the application, claiming he unintentionally abandoned it due to lack of funds. A deliberate decision to abandon an application due to lack of funds is not unintentional abandonment. Despite our repeated requests, you have yet to address this issue. Without a valid and enforceable patent, there can be no infringement.

Very truly yours,



Dorothy P. Whelan

cc: Alana Sharenow, Esq.

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WASHINGTON, DC

**UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

AMAZIN' RAISINS INTERNATIONAL, INC.
an Ontario, Canada corporation,

Plaintiff,

V.

Civ. Action No. 04-12679-MLW

OCEAN SPRAY CRANBERRIES, INC.,
a Delaware corporation,

Defendant.

**EXHIBIT C TO THE DECLARATION OF CHRISTOPHER J. SORENSON IN
SUPPORT OF PLAINTIFF'S OPPOSITION TO DEFENDANT'S MOTION TO AMEND
JUDGMENT AND AWARD FEES**

CONFIDENTIAL DOCUMENT TO BE FILED UNDER SEAL

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

AMAZIN' RAISINS INTERNATIONAL, INC.,
an Ontario, Canada corporation,

Plaintiff,

v.

OCEAN SPRAY CRANBERRIES, INC., a
Delaware corporation,

Defendant.

Civil Action No. 04-12679-MLW

**OCEAN SPRAY'S SUPPLEMENTAL RESPONSES TO PLAINTIFF'S
INTERROGATORIES**

Ocean Spray Cranberries, Inc. further objects and responds to Amazin' Raisins International, Inc.'s interrogatory numbers 1, 2, and 4. These responses are based upon information presently available to Ocean Spray. Ocean Spray reserves the right to use or rely on subsequently discovered information and to further supplement these answers throughout discovery.

GENERAL OBJECTIONS

Ocean Spray maintains and incorporates herein the General Objections set forth in Ocean Spray's Responses to Plaintiff's First Set of Interrogatories dated May 23, 2005.

SUPPLEMENTAL RESPONSES TO INTERROGATORIES

INTERROGATORY NO. 1:

State the facts that form the basis of Ocean Spray's contention that it has not and does not infringe any valid and enforceable claim of the '861 patent, identifying those persons having knowledge of such facts.

RESPONSE: Ocean Spray objects to this interrogatory as overly broad and unduly burdensome in that ARI has not identified the claims it intends to assert in this action. Ocean Spray also

On January 10, 1992, the Patent Office issued a notice of abandonment of the '861 patent application for failure to pay the required issue fee. In response, one of the patent applicants, Jack Mazin, submitted a petition to revive the application on the basis that the abandonment was "unintentional due to lack of funds." The abandonment of a patent application for a "lack of funds" is not unintentional. Therefore, the patent application was improperly revived and the '861 patent is invalid and unenforceable. Without discovery, Ocean Spray cannot determine who has knowledge of these facts.

In addition, Ocean Spray contends that if the claims of the '861 patent are construed to cover the accused process, the claims would be invalid in view of each of the following prior art documents, either alone or in combination with each other: United States Patent No. 3,057,736 issued to Forkner, United States Patent No. 4,542, 033 issued to Agarwala, and/or United States Patent No. 4,775,545 issued to Augustine et al.

INTERROGATORY NO. 4:

For each claim of the '861 patent, fully explain your interpretation of the claim on an element-by-element basis, including any special or uncommon meaning you attribute to any claim term, the portions of the specification and prosecution history that you contend support your interpretation of each claim element or term, and all extrinsic evidence that you contend supports your interpretation of the claim element or term; and identify the element or elements of the '861 patent claims that Ocean Spray contends are not present in the Accused Process.

RESPONSE: Ocean Spray objects to this contention interrogatory as premature because ARI has not identified the claims it intends to assert in this action. Ocean Spray will offer its claim constructions only after ARI identifies the asserted claims, provides its claim construction positions, and provides an opportunity for discovery. Furthermore, it is unduly burdensome for Ocean Spray to respond to contention interrogatories at this point in the case. *See, e.g., B. Braun Medical, Inc. v. Abbott Labs.*, 155 F.R.D. 525, 527 (E.D. Pa. 1994); Fed. R. Civ. P. 33(c) (stating that the court may order that contention interrogatories "need not be answered until after

designated discovery has been completed or until a pre-trial conference or other later time.”). Because discovery has just begun and the patent claims have not been construed by the Court, Ocean Spray’s contentions are preliminary and subject to change. Accordingly, Ocean Spray reserves the right to further respond and/or supplement its response. Subject to these objections and the General Objections, Ocean Spray responds by referring to its response to Interrogatory Number 1 in its entirety for an identification of the element or elements of the ’861 patent claims that Ocean Spray as presently advised contends are not present in the Accused Process.

SUPPLEMENTAL RESPONSE: Ocean Spray maintains its objection that this contention interrogatory as premature as discovery is still ongoing. Accordingly, Ocean Spray’s contentions are preliminary and subject to change. Ocean Spray reserves the right to further respond and/or supplement its response. Subject to these objections and the General Objections, Ocean Spray further responds to this interrogatory as follows:

The limitation “dried fruit” in claim 1 means “a fruit or piece of fruit that contains between about 10% to 18% moisture.” (’861 patent at 3:60-4:4, 4:14-17, 5:56-6:10, Examples 1-11; April 30, 1999 Amendment and Response to Office Action.)

The limitation “substantially remove the natural flavor of the dried fruit” can be given its plain and ordinary meaning and does not require construction.

The limitation “so forming” of claim 1 means “forming with steps identified as (a), (b), and (c) of the process.”


Ocean Spray is unable to determine the scope of the limitation “substantially the same as” in claim 1 because the claim language is vague and ambiguous. Additional discovery may allow Ocean Spray to define this term.

The limitation "whereby the flavored dried fruit product may be easily handled" of claim 1 means that the flavored dried fruit product does not bind together or form lumps. ('861 patent at 3:17-23.)

The limitations or elements of claim 1 that are not present in the Accused Process are identified in Ocean Spray's response to Interrogatory Number 1.

FISH & RICHARDSON P.C., P.A.

Date: November 11, 2005

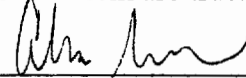

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*Attorneys for Defendant
Ocean Spray Cranberries, Inc.*

VERIFICATION

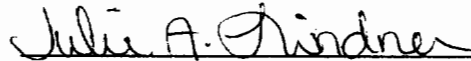
I hereby declare, under the penalty of perjury under the laws of the United States of America, that I am authorized to execute the foregoing answers on behalf of Ocean Spray Cranberries, Inc.; that these answers were prepared with the assistance and advice of counsel and the assistance of employees and representatives of Ocean Spray Cranberries, Inc.; that the answers set forth herein, subject to inadvertent or undiscovered errors, are based on and therefore necessarily limited by the records and information still in existence, presented or recollected and thus far discovered in the course of the preparation of these answers, that consequently Ocean Spray Cranberries, Inc. reserves the right to make any changes in the answers if it appears that omissions or errors have been made therein or that more accurate information is available; and that subject to these limitations the answers set forth herein are true.



Alana Sharenow
Senior Corporate Counsel
Ocean Spray Cranberries, Inc.

CERTIFICATE OF SERVICE

I hereby certify that a true copy of the above document was served upon the attorney of record for each other party by mail/hand on November 11, 2005.


Julie A. Lindner

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October 4, 2005

William R. Woodford
Fish & Richardson P.C., P.A.
3300 Dain Rauscher Plaza
60 South Sixth Street
Minneapolis, MN 55402

Re: *Amazin' Raisins International, Inc. v. Ocean Spray Cranberries, Inc.*
Civil Action No. 04-12679-MLW
M&G No. 14158.1-US-ZA

Dear Mr. Woodford:

I am working with Chris Sorenson on the above-captioned matter. Further to our letters of August 16, 2005, and August 23, 2005, ARI does not believe that Ocean Spray has produced all of the documents requested by ARI. As previously discussed, ARI agreed to review the documents produced by Ocean Spray and analyze the adequacy of the production with respect to damages. Upon reviewing Ocean Spray's production, ARI does not believe the sales summaries provided by Ocean Spray provide sufficient information for ARI to conduct a lost profits and reasonable royalty analysis. Ocean Spray must produce documents sufficient to determine itemized fixed and variable costs associated with the manufacture of each of the flavored fruit products ARI identified in its response to Interrogatory No. 1. Ocean Spray must also produce invoices for all sales of these products and documents concerning any discounts, rebates, or similar items associated with the sale of these items. Documents throughout the period of alleged infringement should be produced, so that ARI can analyze any changes in the costs and revenues associated with these products. Again, these documents are the subject of Request Nos. 12 and 13.

In addition to damages related documents, Ocean Spray's production regarding the process it uses for the production of the above-identified flavored fruit products, which documents are the subject of Request No. 1, is also inadequate. While Ocean Spray did produce some documents regarding this issue, it does not appear that the majority of responsive

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Atlanta
Washington, DC

Sorenson Exhibit E

William Woodford, Esq.
October 4, 2005
Page 2

documents have been produced. For instance, virtually no documents concerning the counter-current extraction process have been produced. Such documents would include information concerning the state of the fruit both before and after this stage of the process, the parameters employed during this process, and any adaptations made to this process in order to produce fruit pieces better suited for the manufacture of flavored fruit products. Likewise, ARI does not believe that all documents concerning the original development of this process have been produced. These documents are highly relevant to the issue of infringement.

Please inform us whether Ocean Spray will agree to produce these documents. If not, please let us know when Ocean Spray is available to discuss the reasons why it feels production of the requested documents is not required.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Todd W. Werner', with a stylized, flowing script.

Todd W. Werner

TSW:rd

cc: Nicholas Papastavros
Gina McCreddie

**UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

AMAZIN' RAISINS INTERNATIONAL, INC.
an Ontario, Canada corporation

Plaintiff,

V.

Civ. Action No. 04-12679-MLW

OCEAN SPRAY CRANBERRIES, INC.,
a Delaware corporation,

Defendant.

PLAINTIFF'S MEMORANDUM IN SUPPORT OF
ITS MOTION TO COMPEL DOCUMENT PRODUCTION

I. INTRODUCTION

Six months ago, Plaintiff Amazin' Raisins International, Inc. ("ARI") served a limited number of document requests on Defendant Ocean Spray Cranberries, Inc. ("Ocean Spray"). These requests seek information going to the core of ARI's claim for patent infringement. In response to ARI's repeated requests for these documents, Ocean Spray merely stated that it is "looking into the issue," but failed to produce the requested documents. Accordingly, ARI respectfully requests that this Court compel Ocean Spray to produce documents responsive to requests 1, 4, 5, and 12.

II. FACTUAL BACKGROUND

About a year ago, ARI sued Ocean Spray for infringement of United States Patent No. 5,188,861 ("the '861 patent"). This patent is directed to a process for preparing a flavored fruit product. Thereafter, the case was transferred to this Court, and ARI served Ocean Spray with its first set of document requests. ARI requested documents concerning the process(es) Ocean

Spray uses in manufacturing its flavored fruit products, as well as documents related to ARI's claim for damages. (Werner Decl., Ex. A).

Despite numerous requests, Ocean Spray has produced only a limited set of documents concerning its manufacturing process. These documents fail to provide adequate information concerning Ocean Spray's process, rather, they merely offer a gross overview of Ocean Spray's method. For instance, Ocean Spray apparently uses an extraction step during its process, yet Ocean Spray's production is virtually devoid of any documents concerning this step. In fact, not one document concerning the development of this extraction process has been produced.

Likewise, Ocean Spray's production of documents relating to ARI's damages claim is grossly inadequate. No sales volumes or financial statements have been produced; nor do any of the documents indicate Ocean Spray's profit margin on the accused products.

Throughout October 2005, ARI sent a number of letters to Ocean Spray attempting to resolve this lack of production. (Werner Decl. Ex. C, D, F, G). Ocean Spray failed to produce any additional documents in response. Rather, Ocean Spray simply responded that it was "looking into the issue," and provided no concrete time when such production might occur. (Werner Decl. Ex. E, H). ARI counsel and Ocean Spray counsel met and conferred on October 19, 2005, regarding Ocean Spray's lack of production, but no resolution was reached regarding these requests. As ARI prepared this memorandum, Ocean Spray eventually stated it would produce liability-related documents but refused to commit to a date by which ARI could expect to receive the documents. (Werner Decl., Ex. I, J). Ocean Spray maintained its refusal to produce damages-related documents. Moreover, Ocean Spray only agreed to produce liability-related documents "subject to the objections" raised in its responses to ARI's document requests. In view of these inappropriate objections and Ocean Spray's delayed discovery practices thus far,

as well as the upcoming expert report deadlines, ARI seeks an ordering overruling Ocean Spray's objections and compelling Ocean Spray to produce the requested documents immediately.

Absent such an order, ARI's ability to prepare expert reports and develop its case will be prejudiced. Of course, should ARI receive all of the requested documents prior to resolution of this motion, ARI will be happy to withdraw the motion as it relates to Request Nos. 1, 4, and 5.

III. DISCUSSION

Under the Federal Rules of Civil Procedure, a party's rights to discovery are very broad. *Atchison Casting Corp. v. Marsh, Inc.*, 216 F.R.D. 225, 227 (D. Mass. 2003); *Cabana v. Forcier*, 200 F.R.D. 9, 17 (D. Mass 2001). A party is entitled to discovery regarding "any matter, not privileged, that is relevant to the claim or defense of any party." Fed. Civ. P. 26(b)(1). The broad scope of discovery "reflects a policy that mutual knowledge of all the relevant facts gathered by both parties is essential to proper litigation." *Atchison*, 216 F.R.D. at 227.

A request is considered relevant if "there is any possibility that the information sought may be relevant to the subject matter of the action." *Ares-Serono, Inc. v. Organon Int'l. B.V.*, 151 F.R.D. 215, 219 (D. Mass. 1993). Objections based on overbreadth or undue burden are not proper absent some concrete showing of such a burden. *See Skinner v. O'Mara*, 2000 U.S. Dist. LEXIS 10922 at *5 (D. N.H. July 25, 2000); *Panola Land Buyers Assn. v. Shuman*, 762 F.2d 1550, 1559 (11th Cir. 1985). Additionally, failure to produce a privilege log can act as a waiver of any applicable privilege with respect to responsive documents that are withheld. *See Fed. R. Civ. P. 26* (1993 comments).

A. Ocean Spray Must Produce Documents Concerning All Aspects of its Manufacturing Process(es).

Document Request Nos. 1, 4, and 5 are all directly related to Ocean Spray's manufacturing processes.

REQUEST NO. 1:

All documents and things concerning or summarizing the process Ocean Spray uses to manufacture or create its flavored fruit products.

RESPONSE: Ocean Spray objects to this request as overly broad and unduly burdensome.

Ocean Spray also objects to this request as seeking information irrelevant to any claim or defense in this action. Ocean Spray further objects to this request to the extent it seeks information protected by the attorney-client privilege, the attorney work product doctrine, and/or any other applicable privilege or immunity. Subject to these objections and the General Objections, Ocean Spray will produce non-privileged, responsive documents within its possession, custody, or control, if any exist, at a time and place mutually convenient to counsel.

In order to prove infringement of a process claim a patentee must show that all elements of the claim are used in the accused process. *RF Delaware, Inc. v. Pac. Keystone Techs., Inc.*, 326 F.3d 1255, 1266 (Fed. Cir. 2003). This request seeks documents related to the process(es) accused of infringing the '861 patent -- the core issue of this litigation. No documents could be more relevant.

Ocean Spray's objections to the request are without merit. Ocean Spray has made no showing that full production of responsive documents would present any undue burden, and therefore cannot raise such an objection with the Court. *See Skinner*, 2000 U.S. Dist. LEXIS 10922 at *5; *Panola Land Buyers Assn.*, 762 F.2d at 1559. Further, Ocean Spray has waived any privilege objections it may have, as it has not yet produced a privilege log.

Notwithstanding its objections, Ocean Spray produced a limited set of documents related only to a flavoring step of the multi-step process it uses to manufacture at least one of its flavored fruit products, and not even all documents concerning this step have been produced. Documents related to the remainder of Ocean Spray's manufacturing process, such as an apparent juice extraction process, have not been produced. Likewise, Ocean Spray has failed to

produce all documents related to the development of its manufacturing process,¹ or quality control reports documenting the state of the cranberries at various stages of the Ocean Spray process. These documents must be produced.

Similar to Document Request No. 1, Requests No. 4 and No. 5 relate directly to the flavored fruit pieces created using the accused process.

REQUEST NO. 4:

All documents and things concerning testing or analysis of cranberries, Ocean Spray's decharacterized fruit pieces, Ocean Spray's flavored fruit products, and any fruit piece being processed by the Accused Process.

RESPONSE: Ocean Spray objects to this request on the ground that "testing," "analysis," and "decharacterized fruit pieces" are vague and ambiguous. Ocean Spray also objects to this request as overly broad and unduly burdensome. In addition, Ocean Spray also objects to this request as seeking information irrelevant to any claim or defense in this action. Ocean Spray further objects to this request to the extent it seeks information protected by the attorney-client privilege, the attorney work product doctrine, and/or any other applicable privilege or immunity. Subject to these objections and the General Objections, Ocean Spray will produce non-privileged, responsive documents within its possession, custody, or control, if any exist, at a time and place mutually convenient to counsel.

REQUEST NO. 5:

All documents and things concerning or summarizing the contents or components of cranberries, Ocean Spray's decharacterized fruit pieces, and Ocean Spray's flavored fruit products, including, but not limited to, the amount of acids, solids, soluble solids, insoluble solids, water, sugar, preservatives, or other components in cranberries, Ocean Spray's decharacterized fruit pieces, and Ocean Spray's flavored fruit products.

¹ Ocean Spray is the assignee of United States Patent No. 5,320,861, entitled "Fruit Extraction and Infusion," which includes specific process steps related to the manufacture of flavored fruit. Ocean Spray has not produced any documents related to the development of this process, despite the fact that experimental data was included in the patent application. Nor has Ocean Spray produced the file history of this patent.

RESPONSE: Ocean Spray objects to this request on the ground that the phrases "contents or components of cranberries" and "decharacterized fruit pieces" are vague and ambiguous. Ocean Spray also objects to this request as overly broad and unduly burdensome. In addition, Ocean Spray also objects to this request as seeking information irrelevant to any claim or defense in this action. Ocean Spray further objects to this request to the extent it seeks information protected by the attorney-client privilege, the attorney work product doctrine, and/or any other applicable privilege or immunity. Subject to these objections and the General Objections, Ocean Spray will produce non-privileged, responsive documents within its possession, custody, or control, if any exist, at a time and place mutually convenient to counsel.

Ocean Spray's objections to these document requests are, again, meritless. The terms and phrases "testing," "analysis," and "contents or components of cranberries" are sufficiently self-explanatory to meet the "reasonable particularity" requirement of Rule 34(b) of the Federal Rules of Civil Procedure. *See Mitsui & Co. v. Puerto Rico Water Res. Auth.*, 79 F.R.D. 72, 82 (D. P.R. 1978) (citing *Moore's Federal Practice*, describing the "reasonably particular" standard as "whether a reasonable man would know what documents or things are called for"). Further, Ocean Spray itself uses the term "decharacterized fruit pieces" in U.S. Patent No. 5,320,861. Arguing that the term is vague is at best disingenuous, and at worst deliberately evasive. Ocean Spray's overbreadth and burdensomeness objections are equally inappropriate because Ocean Spray again fails to particularize any supposed burden it would suffer by responding this request.

As a whole, Ocean Spray's document production is insufficient. Ocean Spray must produce documents related to *all phases* of its process and the products derived therefrom. Accordingly, the Court should compel Ocean Spray to produce all documents responsive to Document Request Nos. 1, 4 and 5.

B. Ocean Spray Must Produce Financial Information So That ARI Can Assemble its Damages Case.

Upon a finding of infringement, a patentee is entitled to damages "adequate to compensate for the infringement but in no event less than a reasonable royalty. . ." 35 U.S.C. § 284. A reasonable royalty is reached by determining the licensing rate at which a hypothetical licensor and licensee would have agreed at the time of infringement. *Georgia-Pacific v. United States Plywood Corp.*, 318 F. Supp. 1116, 1120-21 (S.D.N.Y. 1970), *modified and aff'd.*, 466 F.2d 295 (2d Cir. 1971). *Georgia-Pacific* lists fifteen factors that help a court determine the royalty based on such a hypothetical negotiation, including the commercial success and profitability of the product made under the patent, the portion of the profit credited to the invention, any licenses or licensing negotiations, and the extent to which the infringer has made use of the invention. Alternatively, a patentee can recover any profits it would have made but for infringement by the defendant. *Panduit Corp. v. Stahl Bros. FibreWorks, Inc.*, 575 F.2d 1152, 1156 (6th Cir. 1978).

Document Request No. 12 seeks documents relevant to the issues of lost profits and reasonable royalty.

REQUEST NO. 12:

Documents sufficient to show the unit volume, sales price, profitability, costs, margins, income, and/or revenue derived by or resulting from Ocean Spray's sales of its flavored fruit products during the past seven years.

RESPONSE: Ocean Spray objects to the phrase "unit volume" as vague and ambiguous. Ocean Spray also objects to this request to the extent it is not limited to a reasonable and relevant time period. Subject to these objections and the General Objections, Ocean Spray will produce non-privileged, responsive documents within its possession, custody, or control, if any exist, at a time and place mutually convenient to counsel.

Ocean Spray does not dispute the relevance of the document request. Documents concerning the relative profitability and sales of Ocean Spray's accused flavored fruit products, in comparison to other items sold by Ocean Spray, demonstrate the significance of the accused products to Ocean Spray's operations and financial condition. ARI simply cannot conduct a meaningful reasonable royalty or lost profits analysis without the requested information.

Ocean Spray's objections to Request No. 12 must fail. Ocean Spray's vagueness objections are inappropriate because the phrase "unit volume" is sufficiently self-explanatory to meet the "reasonable particularity" requirement of Rule 34(b).

Ocean Spray's time period objection must fail as well. It appears that Ocean Spray developed its flavored fruit product manufacturing processe(s) to take advantage of cranberry carcasses left over from the manufacture of cranberry juice. Because the two products are made using the same cranberries, ARI needs information from years in which flavored fruit products were not sold in order to determine any cost savings associated with Ocean Spray's juice products.

Ocean Spray should be compelled to produce the requested damages-related documents.

IV. CONCLUSION

Based on the foregoing, ARI respectfully requests this Court to compel Ocean Spray to produce all documents responsive to Document Request Nos. 1, 4, 5, and 12.

Dated: October 27, 2005

Respectfully submitted,

**AMAZIN' RAISINS INTERNATIONAL,
INC.**

By its attorneys,

/s/ Gina M. McCreadie

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Gina M. McCreadie (BBO # 661107)
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**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

AMAZIN' RAISINS INTERNATIONAL, INC.,

Plaintiff,

v.

OCEAN SPRAY CRANBERRIES, INC.,

Defendant.

Civ. Action No. 04-12679-MLW

**ASSENTED-TO MOTION FOR AN EXTENSION OF TIME TO FILE OCEAN SPRAY'S
OPPOSITION TO PLAINTIFFS' MOTION TO COMPEL DOCUMENT PRODUCTION**

Defendant Ocean Spray Cranberries, Inc. hereby moves, with the assent of Plaintiff Amazon' Raisins International, Inc., to extend the deadline for Defendant to submit an opposition to Plaintiff's Motion to Compel Document Production until December 1, 2005. Ocean Spray's opposition is presently due November 10, 2005.

Pursuant to Fed. R. Civ. P. 6(b), this Court may, in its discretion, enlarge a time period prescribed by the rules. The instant motion for an extension of time is not interposed for purposes of delay, and no prejudice will result from granting this motion. Ocean Spray seeks an extension solely to continue discussions with Plaintiff to resolve the issues presented in this motion without intervention from the Court.

WHEREFORE, Defendant respectfully requests that the Court grant this assented-to motion for an extension of time and that the deadline for Ocean Spray's opposition brief be moved to December 1, 2005.

Dated: November 9, 2005

FISH & RICHARDSON P.C., P.A.

/s/William R. Woodford
William R. Woodford (*pro hac vice*)
3300 Dain Rauscher Plaza
60 South Sixth Street
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(612) 288-9696 Facsimile

FISH & RICHARDSON P.C.
Michael E. Zeliger (BBO # 633654)
225 Franklin Street
Boston, MA 02110-2804
(617) 542-5070 Telephone
(617) 542-8906 Facsimile

*Attorneys for Defendant
Ocean Spray Cranberries, Inc.*

60323496.doc

From: William Woodford [mailto:woodford@fr.com]
Sent: Friday, December 16, 2005 11:16 AM
To: Todd S. Werner
Subject: ARI v. Ocean Spray: Motion to Compel

Todd,

The email just confirms our discussion we had a few minutes ago. You agreed to withdraw ARI's motion to compel the production of documents and provide information on the Mantius declaration that you seek. I agreed to produce the Mantius declaration (assuming it was part of the prosecution history of the Mantius patent) and that we would produce additional documents (subject to our objections) relating to examples in the Mantius patent and the development of the CCE process if any are found.

Regards,

Bill

William R. Woodford

~ **Fish & Richardson P.C., P.A.**

3300 Dain Rauscher Plaza
60 South Sixth Street
Minneapolis, MN 55402
Email: woodford@fr.com
Tel: 612-766-2004
Fax: 612-288-9696

**UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

AMAZIN' RAISINS INTERNATIONAL, INC.
an Ontario, Canada corporation

Plaintiff,

V.

Civ. Action No. 04-12679-MLW

OCEAN SPRAY CRANBERRIES, INC.,
a Delaware corporation,

Defendant.

**PLAINTIFF AMAZIN' RAISINS INTERNATIONAL, INC.'S ASSENTED TO
MOTION TO WITHDRAW MOTION TO COMPEL**

Plaintiff Amazin' Raisins International, Inc. ("ARI") respectfully requests the Court to withdraw its Motion to Compel Defendant Ocean Spray Cranberries, Inc. ("Ocean Spray") to produce documents in response to ARI document production requests 1, 4, 5, and 12. ARI has been informed that Ocean Spray believes it has produced all responsive documents it could locate upon a reasonably diligent search. Accordingly, ARI does not believe an order compelling the production of documents in response to requests Nos. 1, 4, 5, and 12 is necessary at this time, and moves the Court to withdraw its motion to compel.

Dated: December 27, 2005

By: /s/ Todd Werner

Douglas J. Williams (MN # 117353)
Christopher J. Sorenson (MN # 210118)
Todd Werner (MN # 033019X)
MERCHANT & GOULD P.C.
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Nicholas G. Papastavros (BBO # 635742)
Gina M. McCreadie (BBO # 661107)
NIXON PEABODY LLP
100 Summer Street
Boston, MA 02110
Telephone: 617-345-1000

ATTORNEYS FOR PLAINTIFF

CERTIFICATE OF SERVICE

I hereby certify that on December 27, 2005, I caused the following document:

1. Plaintiff Amazin' Raisins International, Inc.'s Assented to Motion to Withdraw Motion to Compel;

to be electronically filed with the Clerk of Court through ECF, and that ECF will send an e-notice of the electronic filing to the following:

John C. Adkisson adkisson@fr.com mla@fr.com

William R Woodford woodford@fr.com lindner@fr.com

Michael E. Zeliger zeliger@fr.com omeara@fr.com

Dated: December 27, 2005

/s/Todd Werner
Todd Werner

Keith Cadwallader - 4/10/2006
Amazin' Raisins International, Inc. v. Ocean Spray Cranberries, Inc.

Page 1

1 UNITED STATES DISTRICT COURT
2 DISTRICT OF MASSACHUSETTS

3

4 CASE NUMBER: O4-12679-MLW

5 -----

6 Amazin' Raisins International, Inc.,

7 Plaintiff,

8 versus

9 Ocean Spray Cranberries, Inc.,

10 Defendant.

11 -----

12

13

14

15

16

VIDEOTAPED DEPOSITION OF

17

EXPERT WITNESS

18

KEITH CADWALLADER

19

20

21

22

23

24

25 TAKEN: 10 April 2006 BY: Jacqueline McKone

COPY

Keith Cadwallader - 4/10/2006
Amazin' Raisins International, Inc. v. Ocean Spray Cranberries, Inc.

5 (Pages 14 to 17)

<p style="text-align: right;">Page 14</p> <p>1 Q. The patent clearly distinguishes these --</p> <p>2 A. In my opinion, yes.</p> <p>3 Q. Did you talk about the removal of flavor natural</p> <p>4 flavor?</p> <p>5 A. Yes.</p> <p>6 Q. What did you talk about with respect to that?</p> <p>7 A. What exactly that means possibly.</p> <p>8 Q. What --</p> <p>9 A. What does removal mean?</p> <p>10 Q. Right.</p> <p>11 A. Well, it really depends on the context of the</p> <p>12 process or the process itself; and in the case</p> <p>13 of the Amazin' patent, my understanding based on</p> <p>14 reading it is that removal is a process in which</p> <p>15 the flavor, the original material, the feed</p> <p>16 stock is sufficiently changed so that it's no</p> <p>17 longer recognized as such because -- well,</p> <p>18 that's my understanding of that.</p> <p>19 Q. What about acidulants; did you talk about those</p> <p>20 during your meeting with counsel?</p> <p>21 A. We have talked about acidulant.</p> <p>22 Q. What about the term non-sticky; did you discuss</p> <p>23 that at all?</p> <p>24 A. Not really. Not much.</p> <p>25 Q. When you talk about your understanding of the</p>	<p style="text-align: right;">Page 16</p> <p>1 PhD graduating in 1990 finally with a PhD.</p> <p>2 Q. So what is food science?</p> <p>3 A. What is food science? Well, it's a</p> <p>4 multidisciplinary field, study of food</p> <p>5 particularly looking at various disciplines of</p> <p>6 chemistries, microbiology, chemistry, some</p> <p>7 psychology if you look at sensory for example.</p> <p>8 So pretty much it could be the application of</p> <p>9 various sciences to the study of food.</p> <p>10 Q. Does this have to do more with flavoring, or</p> <p>11 what aspect of food?</p> <p>12 A. No. All aspects of food.</p> <p>13 Q. What are the various aspects of food?</p> <p>14 A. From harvest to processing to canning operations</p> <p>15 to drying operations to all sorts of operations.</p> <p>16 Flavor is one aspect of course. It's important,</p> <p>17 but it's just one -- might even be considered a</p> <p>18 small aspect in relation to overall scheme of</p> <p>19 things in food science.</p> <p>20 Q. What about -- I thought you mentioned food</p> <p>21 chemistry.</p> <p>22 A. Right. It would be a discipline, a</p> <p>23 sub-discipline under the area, subject of food</p> <p>24 science.</p> <p>25 Q. Could you explain what exactly food chemistry</p>
<p style="text-align: right;">Page 15</p> <p>1 patents, is that an understanding that you came</p> <p>2 to on your own?</p> <p>3 A. Yes.</p> <p>4 Q. So did counsel for AIR have a different opinion?</p> <p>5 A. No. I essentially was given full freedom to</p> <p>6 come some up with my own conclusion.</p> <p>7 Q. All the conclusions you made so far in this case</p> <p>8 have been your own?</p> <p>9 A. Yes.</p> <p>10 Q. 100 percent?</p> <p>11 A. 100 percent.</p> <p>12 Q. We're going to get into all this again later.</p> <p>13 So I guess I'll -- rather than diving right in,</p> <p>14 I want to ask you a few things about your</p> <p>15 background.</p> <p>16 A. Okay.</p> <p>17 Q. Could you describe your educational background</p> <p>18 for me please.</p> <p>19 A. Starting with college I assume.</p> <p>20 Q. Yes. That's a good place to start.</p> <p>21 A. Let's see. I began I received my bachelor's</p> <p>22 degree at the University of Georgia in food</p> <p>23 science in 1985 and went from there to pursue</p> <p>24 graduate studies at the University of Florida,</p> <p>25 and at Florida I received both a master's and</p>	<p style="text-align: right;">Page 17</p> <p>1 is.</p> <p>2 A. It could be broken down into various aspects.</p> <p>3 As you get further in your education, you tend</p> <p>4 to specialize. So for example, under food</p> <p>5 chemistry, one could be a protein chemist, or a</p> <p>6 lipid chemist, carbohydrate chemist. Some</p> <p>7 people study strictly water relations in foods,</p> <p>8 and my area is flavor chemistry primarily is my</p> <p>9 specialty.</p> <p>10 Q. I guess I'm more concerned about your area which</p> <p>11 is flavor chemistry. What exactly is that?</p> <p>12 A. Well, it's a lot of things, but it's the study</p> <p>13 of the -- in my particular field, it's the study</p> <p>14 of chemical components in foods that are</p> <p>15 responsible for flavor and the processes that</p> <p>16 can influence them. Also related to the sensory</p> <p>17 perception of those chemicals in foods and how</p> <p>18 various processes may influence those as well.</p> <p>19 Q. So would it be fair to say your specialty is in</p> <p>20 the flavor aspect of food?</p> <p>21 A. That's true. Yes. That would be fair.</p> <p>22 Q. Do you have any experience in food processing?</p> <p>23 A. Yes.</p> <p>24 Q. What kinds of experience?</p> <p>25 A. Well, extensive course work and also</p>

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

AMAZIN' RAISINS INTERNATIONAL, INC.,

Plaintiff,

v.

OCEAN SPRAY CRANBERRIES, INC.,

Defendant.

Civ. Action No. 04-12679-MLW

JOINT MOTION TO MODIFY THE COURT'S SCHEDULING ORDER

Plaintiff Amazin' Raisins International, Inc. ("ARI") and Defendant Ocean Spray Cranberries, Inc. hereby jointly seek to modify the Court's Scheduling Order to seek an early resolution to the above-captioned matter.

This is a patent infringement action. ARI contends that Ocean Spray's process of making flavored cranberry products infringes a single claim of the patent-in-suit. Ocean Spray denies infringement because it contends that several limitations in the asserted claim are not present in its manufacturing process. Over the past several months, the parties have exchanged written discovery and produced responsive documents. In addition, ARI recently completed an inspection of Ocean Spray's manufacturing facility. The parties believe that a motion for summary judgment on the issue of infringement wherein the disputed limitations would be construed by the Court presents the most efficient way to resolve this matter.

To that end, the parties jointly propose that the Court modify its Scheduling Order to provide the following schedule for motion practice on the issue of infringement as follows:

11/30/05 – Deadline to file summary judgment motions on the issue of infringement

12/21/05 – Deadline to file oppositions to summary judgment motions

01/11/05 – Deadline to file a reply in support of the summary judgment motions

The parties also propose a stay of discovery on the issue of damages and the submission of expert reports until after the summary judgment motions on the issue of infringement are resolved by the Court. If the summary judgment motions do not dispose of the case the parties propose the following schedule, which is based on the date of the Court's ruling on the summary judgment motions:

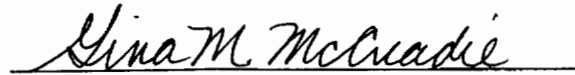
- + 1 day – Damages discovery begins; Defendants to produce responsive documents subject to objections within two weeks
- + 40 days – Report on prospects of settlement and additional summary judgment motions (currently set for April 7, 2006)
- + 45 days – Close of fact discovery (currently set for March 15, 2006 under the Court's April 29, 2005 Scheduling Order)
- + 50 days – Scheduling Conference (currently set for April 18, 2006)
- + 60 days – Expert Reports for party with burden of proof (currently set for December 15, 2005)
- + 90 days – Rebuttal expert reports (currently set for February 1, 2006)
- + 135 days – Trial ready date

The parties also jointly request a case management conference to discuss this motion and the corresponding schedule, to the extent the Court deems such advisable.

WHEREFORE, ARI and Ocean Spray respectfully request that the Court grant this joint motion to modify the Court's Scheduling Order.

Dated: 11/17/05

NIXON PEABODY LLP



Nicholas G. Papastavros (BBO # 635742)
Gina M. McCreadle (BBO # 661107)
100 Summer Street
Boston, MA 02110
(617) 345-1000

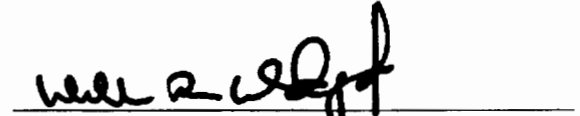
MERCHANT & GOULD P.C.

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(612) 332-5300 Telephone
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*Attorneys for Plaintiff
Amazin' Raisins International, Inc.*

Dated: 11/17/2005

FISH & RICHARDSON P.C., P.A.



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(617) 542-5070 Telephone
(617) 542-8906 Facsimile

*Attorneys for Defendant
Ocean Spray Cranberries, Inc.*

60323848.doc

CERTIFICATE OF SERVICE

I hereby certify that on November 17, 2005, a true and correct copy of the *Joint Motion to Modify the Court's Scheduling Order* was served upon the attorney of record for each party registered for electronic notification via the Court's electronic filing system and via first class mail on the following:

John C. Adkisson
Fish & Richardson
Suite 3300
3300 Dain Rauscher Plaza
60 S 6th St.
Minneapolis, MN 55402


Gina M. McCreddie

**UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

AMAZIN' RAISINS INTERNATIONAL, INC.
an Ontario, Canada corporation,

Plaintiff,

V.

Civ. Action No. 04-12679-MLW

OCEAN SPRAY CRANBERRIES, INC.,
a Delaware corporation,

Defendant.

**EXHIBIT L TO THE DECLARATION OF CHRISTOPHER J. SORENSON IN
SUPPORT OF PLAINTIFF’S OPPOSITION TO DEFENDANT’S MOTION TO AMEND
JUDGMENT AND AWARD FEES**

CONFIDENTIAL DOCUMENT TO BE FILED UNDER SEAL

Jack Mazin

06/02/2006

Page 1

1 UNITED STATES DISTRICT COURT
2 FOR THE DISTRICT OF MASSACHUSETTS
3

4 - - - - - x
5 AMAZIN' RAISINS INTERNATIONAL INC., :
6 an Ontario, Canada corporation, :
7 Plaintiff, : Civil Action No.
8 vs. : 04-12679-MLW
9 OCEAN SPRAY CRANBERRIES, INC., :
10 a Delaware corporation, :
11 Defendant. :
12 - - - - - x

13
14 Toronto, Ontario, Canada
15 Friday, June 2, 2006
16

17 Videotaped Deposition of:

18 JACK MAZIN

19 the witness, called for examination by counsel
20 for the Defendant, pursuant to notice and
21 agreement, commencing at 8:30 a.m., at
22 Sheraton Four Points Hotel, 6257 Airport Road,
23 Mississauga, Ontario, before Virlana Kardash, RPR,
24 CSR, Commissioner of Oaths, when were present on
25 behalf of the respective parties:

Jack Mazin

06/02/2006

<p style="text-align: right;">Page 114</p> <p>1 MR. SORENSON: Again, be careful when 2 you're talking about counsel and letters. Just be 3 careful to answer his questions in a way that does not 4 disclose any communications with counsel. 5 THE WITNESS: Okay. 6 MR. SORENSON: Either our office or your 7 counsel before. 8 THE WITNESS: So not disclosing what was 9 said -- what was discussed with counsel. 10 MR. SORENSON: Right. You may not disclose 11 any discussions that you had with your counsel. 12 THE WITNESS: Sorry. If you can repeat the 13 question, I'd appreciate it. 14 MR. SORENSON: I think his questions don't 15 call for that. I just want to follow up with the 16 answers, to be careful that you not disclose. 17 THE WITNESS: Okay. Sorry, Mike. 18 BY MR. ZELIGER: 19 Q We were talking about what you had done 20 prior to initiating the lawsuit. And I think you said 21 you sent a letter. So please continue from that 22 point. 23 A Yes, I sent a letter. And again, it was 24 quite an innocent letter. I just said, "Here's my 25 patent. Could you please look at this." And it was</p>	<p style="text-align: right;">Page 116</p> <p>1 BY MR. ZELIGER: 2 Q Do you recall during our settlement meeting 3 in Washington Mr. Williams saying that the decision to 4 settle this dispute lies solely with Merchant & Gould? 5 MR. SORENSON: And I will object to that 6 question under rule 408 as well as mischaracterizing 7 the discussion. 8 BY MR. ZELIGER: 9 Q Do you recall Mr. Williams saying that? 10 MR. SORENSON: Same objection. 11 THE WITNESS: I don't recall. 12 BY MR. ZELIGER: 13 Q Is it, in fact, true that Merchant & Gould 14 holds the decision of whether to settle this 15 litigation? 16 MR. SORENSON: Let me think about that for 17 a second. I need to take a break and consult with my 18 client about whether the answer will disclose 19 privileged information. 20 MR. ZELIGER: Very well. 21 MR. SORENSON: Let's do that. 22 (Discussion off the record.) 23 MR. SORENSON: We've had an 24 off-the-record -- I've had an off-the-record 25 consultation with my client in relation to the pending</p>
<p style="text-align: right;">Page 115</p> <p>1 handwritten on a fax copy directly to Randy. I 2 initiated it. I called his office. 3 I spoke with him directly. I spoke with the 4 secretary, then I spoke with Randy. Randy returned my 5 phonecall. Again, very engaging and personable. And 6 he said he'll look at it and he'll get back at me. 7 And then we were going to have a meeting down at Ocean 8 Spray head office with Randy Papadellis. 9 But again, in-house counsel looked at my 10 patent -- I think it was Neil Bryson (ph) -- and then 11 decided, "No, you can't meet with Mr. Mazin until they 12 hold you harmless." And after that, it got to more 13 formal letter writing. 14 Q Who at Amazon' Raisins has the authority to 15 settle this suit if you so choose? 16 A If I so choose? 17 Q Yes? 18 A Jack Mazin. 19 Q Do you need Merchant & Gould's permission 20 before you can settle this suit? 21 MR. SORENSON: Objection. I'm going to 22 instruct the witness not to answer that question. I 23 believe that calls for the disclosure of 24 attorney-client privileged information. 25</p>	<p style="text-align: right;">Page 117</p> <p>1 question, and I have determined that I believe that 2 the answer to the question does not call for the 3 disclosure of attorney-client information, and I will 4 allow the witness to answer the question. 5 BY MR. ZELIGER: 6 Q Do you have the question in mind? 7 MR. SORENSON: Let's read the question 8 back. 9 THE WITNESS: Yes, I'd appreciate it. 10 (The reporter read the record as requested.) 11 THE WITNESS: Absolutely not. 12 BY MR. ZELIGER: 13 Q Do you recall Mr. Williams saying that at 14 the meeting that we had in Washington? 15 MR. SORENSON: Objection. Asked and 16 answered. 17 THE WITNESS: I do not recall that at all. 18 BY MR. ZELIGER: 19 Q Do you recall Mr. Williams talking about 20 how the money was already in the budget and we're 21 committed to trying the case? 22 MR. SORENSON: Objection. Mischaracterizes 23 the evidence. Rule 408. 24 BY MR. ZELIGER: 25 Q Do you recall that?</p>

30 (Pages 114 to 117)

Page 118

1 A I recall something about a budget. But I
2 don't recall the specifics of that. But as far as the
3 settlement of this particular case, that is my
4 decision.

5 Q Very well. What I'd like to do now is take
6 an early -- we can go off the record.

7 (Discussion off the record.)

8 (Whereupon, at 11:06 a.m., the deposition was
9 recessed, to be reconvened at 11:40 p.m. this same
10 day.)
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31 (Pages 118 to 121)

ARI / Ocean Spray

Page 1 of 1

Amy J. Mullenix

From: Christopher J. Sorenson
Sent: Wednesday, March 22, 2006 11:35 AM
To: Douglas Williams; Todd S. Werner; Amy J. Mullenix; Melissa Wisher; Amy J. Mullenix
Subject: FW: ARI / Ocean Spray

fyi and for the file.

From: Zeliger, Michael E. [mailto:mzeliger@klng.com]
Sent: Wednesday, March 22, 2006 10:55 AM
To: Christopher J. Sorenson
Subject: ARI / Ocean Spray

CONFIDENTIAL SETTLEMENT COMMUNICATION PURSUANT TO FRE 408 AND AGREEMENT OF THE PARTIES

Chris,

I write in response to your request for certain Ocean Spray financial information. Since you and your client have agreed to keep this information confidential, you may share with your client that Ocean Spray's net revenue for the accused products (excluding blueberry products) for the time period January of 2002 until the present is approximately . We do not feel comfortable sharing cost or profit margin information at this time, though we may be willing to do so on an outside counsel only basis at the mediation. You may also share with your client that Ocean Spray has previously taken a relevant license. As Mr. Mantius explained during his deposition (191:11-191:14), the effective royalty rate for this license was less than

Please advise if there is an opening proposal that you would like us to consider in advance of the meeting.

Regards,

Mike

Michael E. Zeliger
Kirkpatrick & Lockhart Nicholson Graham LLP
State Street Financial Center
One Lincoln Street
Boston, MA 02111
Direct: (617) 951-9153
Fax: (617) 261-3175
mzeliger@klng.com

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Sorenson Exhibit N

03/22/2006

Christopher J. Sorenson

From: Zeliger, Michael E. [mzeliger@klnng.com]
Sent: Thursday, October 19, 2006 11:02 AM
To: Christopher J. Sorenson; William Woodford
Cc: Douglas Williams; Amy J. Mullenix; Todd S. Werner
Subject: RE: ARI v. Ocean Spray -- Confidential Settlement Communication, Subject To FRE 408.

Chris,

It is clear from your communication that ARI is turning a blind eye to the merits of the case. Even if I accept as true that "wet" can mean "dry" and "remove" can mean "balance" (and the Federal Circuit agrees), the asserted claim is clearly anticipated, as we have previously pointed out. If need be, the Court, jury and/or PTO will so determine. Moreover, there is some doubt about whether the plaintiff owns this patent (an issue for which we will now move to compel). Given these fundamental problems with the plaintiff's case, its position outlined below is at least disappointing, if not absurd - especially the notion that it can dictate Ocean Spray's use of its current counter-current process.

The plaintiff's proposals are hereby rejected. Ocean Spray has concluded that the parties are too far apart to warrant further discussion. Accordingly, I suggest that we so notify the Court today. Please advise if you are available for a joint call this afternoon.

Regards,

Mike

Michael E. Zeliger
Kirkpatrick & Lockhart Nicholson Graham LLP
State Street Financial Center
One Lincoln Street
Boston, MA 02111
Direct: (617) 951-9153
Fax: (617) 261-3175
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mez7@cornell.edu

view bio at <http://www.klnng.com/professionals/detail.aspx?professional=2351>

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For more information about K&LNG, visit us at www.klnng.com.

From: Christopher J. Sorenson [mailto:CSorenson@merchantgould.com]
Sent: Thursday, October 19, 2006 10:31 AM
To: Zeliger, Michael E.; William Woodford
Cc: Douglas Williams; Amy J. Mullenix; Todd S. Werner
Subject: ARI v. Ocean Spray -- Confidential Settlement Communication, Subject To FRE 408.

Sorenson Exhibit O

09/18/2007

Mike,

ARI has from the beginning of this lawsuit been certain that Ocean Spray's process, beginning with decharacterized fruit, infringes claim 1 of the Mazin patent. ARI is also appreciative of the efforts that both parties have made to limit the costs and to cooperate in this litigation so that expenses could, where possible, be minimized.

We believe strongly, as we always have, that this case turns on claim construction. It is unfortunate that it has taken longer than we both expected to have the hearing, but given the Court's comments last week, we believe that the Court understands that patent claims are not to be construed as any person on the street might understand them, but as one of ordinary skill in the art would. Thus, although there may be some semantic and superficial appeal to the notion that "dried" cannot mean "wet," or that "to remove" cannot mean "to balance," Ocean Spray's basic claim construction lacks merit.

We also intend to fully explore the discovery of all communications between Ocean Spray and its opinion counsel, and to further develop facts pertaining to willful infringement in the coming months.

With that said, ARI is also cognizant of the fact that Ocean Spray is not interested in developing a business relationship that would entail the license or sale of raisin-based products. However, it is clear that the market is now ready for an alternative to high sugar snack foods, and ARI's business plan is to move swiftly into the United States market with its flavored Raisins.

We propose one of three options to settle this case.

- 1) Ocean Spray takes a non-exclusive, fully paid license to the Mazin Patent for use with any fruit. Ocean Spray makes a one time payment of \$10,000,000.00 for this license.
- 2) Ocean Spray takes a non-exclusive, partially paid license to the Mazin Patent for use with any fruit. Ocean Spray pays a royalty of 8% on gross revenue from future sales of all accused products, with an up-front payment of \$5,000,000.00 for past infringing sales.
- 3) Ocean Spray takes a non-exclusive license to Claim 1 of the Mazin Patent, limited in scope to cranberries, and agrees to continue processing its flavored cranberries exclusively with its current counter-current process. Ocean Spray agrees to mark the accused products with the Mazin Patent. Ocean Spray agrees to pay \$1,000,000.00 for past infringement, and agrees to a future royalty payment of 3% on gross revenue from the sale of the accused products.

We look forward to your response.

Sincerely,

Christopher J. Sorenson, Esq.
Merchant & Gould
An Intellectual Property Law Firm
80 S. 8th St., 3200 IDS Center
Minneapolis, MN 55402
612-336-4645
csorenson@merchant-gould.com

Sorenson Exhibit O

09/18/2007

Sorenson Exhibit O

09/18/2007

**UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS**

AMAZIN' RAISINS INTERNATIONAL, INC.,

Plaintiff,

v.

OCEAN SPRAY CRANBERRIES, INC.,

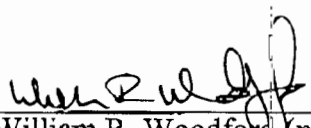
Defendant.

Civ. Action No. 04-12679-MLW

DEFENDANT'S DEPOSITION NOTICE OF DR. KEITH CADWALLADER

PLEASE TAKE NOTICE that, pursuant to Rules 26 and 30 of the Federal Rules of Civil Procedure, Defendant Ocean Spray Cranberries, Inc. by its attorneys, Fish & Richardson P.C., will take the deposition of Dr. Keith Cadwallader at the offices of Merchant & Gould, 3200 IDS Center, 80 South Eighth Street, Minneapolis, MN 55402, commencing at 9:00 a.m. on April 10, 2006. The deposition will take place upon oral examination pursuant to the Federal Rules of Civil Procedure before an officer duly authorized by law to administer oaths and record testimony. Some or all of the deposition testimony may be recorded by sound, sound-and-visual, or stenographic means.

Dated: April 6, 2006




William R. Woodford (*pro hac vice*)
FISH & RICHARDSON P.C.
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Minneapolis, MN 55402

Michael E. Zeliger (BBO # 633654)
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*Attorneys for Defendant
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CERTIFICATE OF SERVICE

I hereby certify that a true copy of the above document was served upon the attorney of record for each other party by facsimile and hand delivery on April 6, 2006.


Julie Lindner

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Date April 6, 2006

To Todd S. Werner, Esq.
Merchant & Gould

Facsimile number (612) 332-9081

From William R. Woodford

Re *Amazin' Raisins International v. Ocean Spray Cranberries, Inc.*
Civil Action No. 04-12679-MLW

Number of pages
including this page 4

Message Please see attached.

NOTE: This facsimile is intended for the addressee only and may contain privileged or confidential information. If you have received this facsimile in error, please immediately call us collect at 612 335-5070 to arrange for its return. Thank you.

Sorenson Exhibit P

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

AMAZIN' RAISINS INTERNATIONAL, INC.,

Plaintiff,

v.

OCEAN SPRAY CRANBERRIES, INC.,

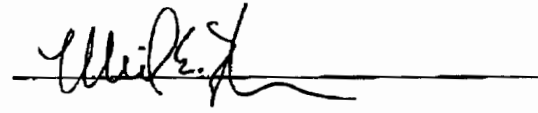
Defendant.

Civil Action No. 1:04-cv-12679-MLW

NOTICE OF DEPOSITION OF AMIR LALJI

PLEASE TAKE NOTICE that, pursuant to rules 26 and 30 of the Federal Rules of Civil Procedure, Defendant Ocean Spray Cranberries, Inc. will take the deposition upon oral examination of Amir Lalji on June 1, 2006 at the Park Plaza Hotel, 33 Carlson Court, Toronto ON M9W6H5, commencing at 1:00 p.m. and continuing from day to day until completion. The deposition shall be taken pursuant to the Federal Rules of Civil Procedure before an officer duly authorized by law to administer oaths and record testimony. The deposition will be recorded by stenographic means and may also be recorded by audio and/or visual means. You are hereby invited to attend and cross examine.

Dated: May 24, 2006



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*Attorneys for Defendant
Ocean Spray Cranberries, Inc.*

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

AMAZIN' RAISINS INTERNATIONAL, INC.,

Plaintiff,

v.

OCEAN SPRAY CRANBERRIES, INC.,

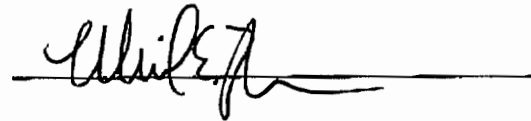
Defendant.

Civil Action No. 1:04-cv-12679-MLW

NOTICE OF DEPOSITION OF JACK MAZIN

PLEASE TAKE NOTICE that, pursuant to rules 26 and 30 of the Federal Rules of Civil Procedure, Defendant Ocean Spray Cranberries, Inc. will take the deposition upon oral examination of Jack Mazin on June 2, 2006 at the Park Plaza Hotel, 33 Carlson Court, Toronto ON M9W6H5, commencing at 9:00 a.m. and continuing from day to day until completion. The deposition shall be taken pursuant to the Federal Rules of Civil Procedure before an officer duly authorized by law to administer oaths and record testimony. The deposition will be recorded by stenographic means and may also be recorded by audio and/or visual means. You are hereby invited to attend and cross examine.

Dated: May 24, 2006



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*Attorneys for Defendant
Ocean Spray Cranberries, Inc.*

LEXSEE



Caution

As of: Sep 26, 2007

POLAROID CORPORATION, Plaintiff v. EASTMAN KODAK COMPANY, Defendant

Civil Action No. 76-1634-MA

UNITED STATES DISTRICT COURT FOR THE DISTRICT OF MASSACHUSETTS

1990 U.S. Dist. LEXIS 17968; 16 U.S.P.Q.2D (BNA) 1481

October 12, 1990, Decided

SUBSEQUENT HISTORY: [*1] As Corrected
January 11, 1991.

CASE SUMMARY:

PROCEDURAL POSTURE: On plaintiff's judgment against defendant for infringement of 20 claims of seven patents related to instant photography, resolution of damage issues was sought in this post-liability phase of the bifurcated trial, including the issue of punitive damages under [35 U.S.C.S. § 284](#).

OVERVIEW: Plaintiff was awarded judgment against defendant for infringement of 20 claims of seven patents related to instant photography. Damage issues were reserved to this post-liability phase of the bifurcated trial. Plaintiff sought to recover lost profits that it would have earned in the "but for" world, during the period that it would have enjoyed a lawful monopoly. The court held that defendant's infringement was not wilful, thereby precluding increased damages pursuant to [35 U.S.C.S. § 284](#). The court calculated the lost profits by extensive findings, considering plaintiff's marketing capabilities, manufacturing capacities, market influences, the effect of dual advertising and price erosion had it occurred, and an incremental income method for determining lost profits, among other considerations. Plaintiff was also awarded reasonable royalty on infringing sales for which plaintiff would have realized little or no profit and infringing sales that plaintiff would not have been able to make because of limits in its manufacturing and marketing capabilities.

OUTCOME: The court held that defendant's infringement was not wilful, thus precluding punitive damages; damages were calculated for lost profits and reasonable royalty on infringing sales for which plaintiff would have realized little or no profit due to limited manufacturing and sales capability.

JUDGES: A. David Mazzone, United States District Judge.

OPINION BY: MAZZONE

OPINION

OPINION

I. INTRODUCTION

On April 26, 1976, Polaroid Corporation ("Polaroid") filed its complaint charging that Eastman Kodak Company ("Kodak") had infringed twelve Polaroid patents relating to integral instant cameras and film. Over the next five years, the parties engaged in extensive discovery on the issues of liability and infringement. Those issues were tried before Judge Rya Zobel between October 5, 1981 and February 26, 1982. On September 13, 1985, Judge Zobel, in a comprehensive and carefully detailed Memorandum of Decision, found Kodak had infringed twenty claims of seven valid Polaroid patents. Two patents were found invalid. One was found not infringed. One was found invalid before trial and Polaroid

withdrew its claims on another patent before trial. Judge Zobel did not assign to any single patent credit for the success of integral instant cameras and film, but found that integral instant photography, as commercialized by Polaroid and Kodak, relied on the inventions of the seven patents held valid and infringed. Judgment was entered on October 11, 1985, and, [*2] on January 8, 1986, Kodak was enjoined from further infringement of the five patents which had not yet expired. The damages issues were reserved to the post-liability phase of the bifurcated trial. [Polaroid Corp. v. Eastman Kodak Co., 641 F. Supp. 828 \(D. Mass. 1985\)](#), stay denied, [833 F.2d 930](#) (Fed. Cir.), aff'd, [789 F.2d 1556](#) (Fed. Cir.), cert. denied, [479 U.S. 850 \(1986\)](#).

The story of this case to date is told in the foregoing trial and appellate opinions. That story will not be retold here except where necessary for a complete understanding of the particular issue under consideration. Suffice to say that this case involves not only the patents, but the history of a new industry, that of integral instant photography. It involved from the outset the only two competitors in the field, locked in a bitter, unyielding, exhausting and expensive litigation for over fourteen years, and the struggle has not yet ended. This is the latest, but probably not the last time the parties confront each other.

The precise issues that were reserved for this phase of the litigation are:

1. Whether Kodak's infringement [*3] of any one or more of the patents in suit was willful and deliberate.
2. The amount of damages adequate to compensate Polaroid for Kodak's infringement, together with interest, and whether such damages should be increased up to three times the amount found, all in accordance with [35 U.S.C. § 284](#).
3. Whether costs shall be taxed against either party.
4. Whether Polaroid is entitled to its reasonable attorneys' fees because this is an "exceptional case" within the meaning of [35 U.S.C. § 285](#), and if so, the quantum of those fees.

[Polaroid Corp., supra, 641 F. Supp. at 878](#).

The overriding issue, which therefore commands the greatest portion of this opinion, is determining the amount of damages adequate to compensate Polaroid for Kodak's infringement. In this introduction, I describe the trial as it was conducted. I follow with the elemental legal principles which I kept constantly in mind as I considered particular issues. I then set out the pivotal questions and my approach to those questions.

This case came before me for trial without jury. The trial lasted ninety-six days. Polaroid rested its case [*4]

after fifty days, calling twelve witnesses, and introducing hundreds of exhibits. It also submitted portions of the depositions of an additional seventy-three witnesses. Kodak rested its case after forty-six days, calling fifteen witnesses, introducing hundreds of exhibits, and submitting portions of the depositions of seventy-one Polaroid witnesses, one Kodak witness, and fourteen non-party witnesses. Experts of national repute were presented by both sides to render their opinions of what would have happened in a world that never existed. They testified as to what management strategy, planning, and control would have been in a world without Kodak. They testified about marketing capability, about camera and film manufacturing capabilities, and produced econometric models to fortify their conclusions. They testified about cost accounting methods, reasonable royalty rates, interest rates, and the basis upon which to calculate interest. Their opinions were predictably, and discouragingly, widely disparate on almost every point.

The case presented many difficult and intricate factual questions. There were broad, sweeping questions of corporate vision, motivation, and management decision-making. [*5] There were discrete, narrow questions of product forecasting, product quality, manufacturing processes, and costs. The case also presented complex legal questions unique to the instant photography industry and its market. One most difficult problem was avoided. Just as Judge Zobel did not single out any one patent to credit with the success of integral instant photography, the parties here have treated the patents as a group for the purpose of a damage award. Assessing damages for the infringement of each patent individually based on that patent's contribution to the product would have added a hopelessly complex analysis to an already complex trial and was well avoided.

Not surprisingly in a case of this magnitude, lead counsel for both sides divided up the issues, assigning counsel exclusively to prepare and present specific segments such as manufacturing capacity, marketing, costs, willfulness, and royalty rates. Experts were not deposed prior to trial, but their reports were submitted and exchanged. Except for one area -- willfulness -- counsel had years to prepare their assignments and their witnesses. One positive result was an efficient trial with minimum delay and interruption [*6] except as necessitated by my schedule and docket demands. One negative result was a highly stylized, very technical presentation. The only surprise was that despite sharing all of the evidence that was ultimately produced at trial among all of the experts, the parties' positions were irreconcilably apart in every area. It was necessary to forge an independent course in technical, complicated areas in an effort to reach a principled result. I believed then, and continue to believe, that this matter could and should have

been resolved by the parties at enormous savings to themselves, and to the resources of the court.

Throughout the trial, I kept in mind fundamental guidance. The recovery of damages for patent infringement is governed by [35 U.S.C. § 284](#). [Section 284](#) reads, in relevant part:

Upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court.

The [*7] U.S. Supreme Court defined damages contemplated by the statute as follows:

The present statutory rule is that only "damages" may be recovered. These have been defined by this Court as "compensation for the pecuniary loss he [the patentee] has suffered from the infringement" They have been said to constitute "the difference between his pecuniary condition after the infringement, and what his condition would have been if the infringement had not occurred."

[Aro Mfg. Co. v. Convertible Top Co., 377 U.S. 476, 507 \(1964\)](#) "citations" omitted).

The law recognizes two possible measures of recovery, lost profits or a reasonable royalty. Under either method, the purpose is the same: to compensate the patentee for actual injuries.¹ The choice between the lost profits method of determining damages and the reasonable royalty method has been explained as follows:

The general rule for determining the actual damages to a patentee that is itself producing the patented item, is to determine the sales and profits lost to the patentee because of the infringement. [*8] Although the statute states that the damage award shall not be "less than a reasonable royalty", [35 U.S.C. § 284](#), the purpose of this alternative is not to provide a simple accounting method, but to set a floor below which the courts are not authorized to go.

[Del Mar Avionics, Inc. v. Quinton Instrument Co., 836 F.2d 1320, 1326 \(Fed. Cir. 1987\)](#). Lost profits are the preferred measure of damages. Therefore, I begin my analysis with a determination of lost profits.

¹ Of course, [section 284](#) allows the Court to increase the damages up to threefold if the infringement is found to be willful. [Section 285](#) permits the award of attorneys' fees in an "exceptional case." Those questions are discussed in Sections VIII and IX.

Both sides recognize the approach to lost profits set out in [Panduit Corp. v. Stahlin Bros. Fibre Works, 575 F.2d 1152 \(6th Cir. 1978\)](#). [*9] To meet the Panduit test, Polaroid must prove: (1) demand for the patented product in the market; (2) the absence of an acceptable non-infringing substitute; (3) its manufacturing and marketing capability to exploit the demand; and (4) a detailed computation of the amount of profit it would have made. [Id. at 1156](#). Polaroid's burden of proof on lost profits is not absolute, but one of "reasonable probability." [Paper Converting Machine Co. v. Magna-Graphics Corp., 745 F.2d 11, 21 \(Fed. Cir. 1984\)](#). Doubts concerning the calculation of lost profits must be resolved against the infringer. [Del Mar Avionics, Inc., 836 F.2d at 1327](#).

Beginning with the Panduit lost profits method, even if it is later decided that a reasonable royalty is more appropriate for some years, the question of demand must be resolved first. Everything else flows from demand. While issues such as manufacturing capacity are extremely complicated factually, they are not conceptually difficult. The question of demand, however, contains at least two profound conceptual problems.

The first problem is the question of market expansion. It has both legal and [*10] factual elements. Initially, I will investigate the legal standard to be applied and see what type of factual questions the rule leaves open. I will consider the evidence of market expansion. There is some direct evidence, such as predictions and contemporaneous statements about market expansion. The bulk of the evidence is inferential, however. There is testimony of Polaroid and Kodak executives about what happened in the relevant years and consumer market research examining the question of why people bought instant cameras. There is expert testimony of Professors Dolan and Buzzell, based upon their surveys of market conditions, historical sales, and market research. There is expert testimony of Professors Fisher and Baumol, based on their econometric models.

The second problem is intimately related to the first; it is the question of translating Kodak sales into Polaroid sales in the world without Kodak, the "but for" world, or to put it more directly, what price Polaroid could have charged for the additional camera sales in the world without Kodak. The only undisputed fact is the quantity and price of the cameras and film Kodak did sell in the infringing years.

Once those questions [*11] are resolved, I will turn to marketing and manufacturing capability, costs, and other issues in the following order: an overview of the historical background of the case and the parties' positions (Section II); the instant photography market (Section III); Polaroid's manufacturing capacity (Section IV); costs (Section V); the calculation of lost profits (Section

VI); the calculation of the reasonable royalty rate (Section VII); willfulness (Section VIII); attorneys' fees (Section IX); and prejudgment and postjudgment interest (Section X). My conclusion and a summary of the award appears in Section XI, followed by the appendices.

This introduction closes with my acknowledgement that this opinion is lengthy, partly because my findings and conclusions contain specific references to certain witnesses, events, or exhibits. Those references should not be construed as the most critical portions of the record. I considered the entire record, whether produced through trial witnesses, deposition, exhibits, or stipulations. Not only were witnesses in sharp disagreement, but thousands of pages of documents, dredged up from long dormant corporate files by industrious counsel over years of discovery, [*12] often contained statements, sometimes by the witness or by associates, which appeared to belie the position taken at trial. When confronted with these inconsistencies or discrepancies, witnesses sought to put their own "spin" on the statements. For example, conflicting views in marketing studies were sometimes ignored, or dismissed out of hand, or disparaged as "half ideas" or "half truths," or a "rare sensible comment." Of course, I assessed a witness's credibility, and weight to be given the testimony, on the usual criteria of fairness, motivation, candor and demeanor of the witness. In accepting or rejecting positions, I make specific references to the record when I find the testimony or exhibit particularly compelling or illustrative.

II. AN OVERVIEW

Edwin H. Land, the founder of Polaroid, began work on instant photography in 1944. In December 1948, Polaroid introduced the first instant cameras and film. Instant photography created a sensation, even though it required special handling. In order to develop the film after taking the picture, the user had to time and pull the print out of the camera, peel off and dispose of a protective chemical-laden paper backing and apply [*13] a special coating to the final picture. The cameras were heavy and bulky. Over time, Polaroid refined the early system, developing more sophisticated technology, better design and appearance, better quality photographs and, finally, color prints.² Still, even as late as 1971, the user still had to peel away the protective layer from the finished print.

² This later generation of cameras were called "pack" cameras because the film came in square packs as opposed to the earlier models which used traditional roll film.

The peel-apart business was a profitable one for Polaroid. In the early years of pack camera sales, 1963-1969, Polaroid grew three and a half times with after-tax

profits averaging above thirteen percent of sales. After the initial learning curve was mastered, gross margins for peel-apart film were in the range of fifty to sixty percent and gross margins for cameras were in the range of forty to fifty percent. Despite these margins, however, the technology problems of the system kept it from being [*14] attractive to the average consumer and, as later marketing research showed, made a lasting negative impression on the public. Even as late as 1979, seven years after the peel-apart system was replaced, many people still associated Polaroid photography with the messy peel-apart product.

In 1972, Polaroid introduced a sleek folding camera, the Model SX-70. The film used with this camera developed without any special handling by the user and, the peel-off, protective paper was eliminated. Perhaps the most amazing feature of the SX-70 system was that the picture developed before the eyes of the consumer. The SX-70 was so revolutionary that both Time and Life magazines reported its introduction as a cover story in 1972.

Although almost a million SX-70 cameras were sold in 1974, a record for cameras priced over \$ 100, Polaroid did not earn a satisfactory profit on this model. First, Polaroid predicted greater demand in 1973 and 1974 than actually materialized. Therefore, when sales failed to measure up, Polaroid was forced to cancel the planned construction of additional manufacturing facilities and lay off workers. Second, the first three years of SX-70 production were plagued [*15] with manufacturing problems. For the first time in its history, Polaroid manufactured many of the components for its cameras instead of contracting with outside vendors for their production. Modules were always in short supply. The precision plastics and the film batteries also created a great deal of trouble. Not until 1975 did Mr. William McCune, then Chief Executive Officer of Polaroid, believe that all the SX-70 problems had been worked out.

These problems chipped away at both Polaroid's profit margins and its public image. The company had been aiming for a profit margin of forty to fifty percent on cameras and between fifty and sixty percent on film, but it never came close to achieving these goals. In 1974, Polaroid sold SX-70 film at a loss. A battery problem required costly repair and the company had to give away a great deal of replacement film. Manufacturing difficulties kept Polaroid from meeting the demand for cameras in 1973. These problems also hurt Polaroid's image with consumers; SX-70's problems were well publicized and market research as late as 1978 revealed lasting negative impressions of the SX-70 system.

The "top of the line" SX-70 was originally priced at [*16] \$ 120 and remained at that price until 1976. Polar-

oid did not raise prices for fear demand would be adversely affected. (TR 910; DF 20,2404).³ In 1974, Polaroid introduced the SX-70 Model 2, a slightly less sophisticated camera which sold for \$ 102. In 1975, Polaroid went one step further and introduced the Model 3, priced at \$ 83, \$ 13 below Polaroid's cost to manufacture the camera. Sales of Model 3 were particularly disappointing. In 1975, total SX-70 sales fell to 741,000 units. By 1976, Polaroid had invested about \$ 600 million on the SX-70 project.

3 The trial transcript is cited as "TR". Exhibits are designated "PT" for plaintiff, Polaroid, and "DF" for those introduced by the defendant, Kodak.

In March 1976, Polaroid introduced the Pronto!, a non-folding integral camera, which retailed for approximately \$ 60. Polaroid had begun work on the Pronto! as early as 1973, aiming to incorporate the new integral technology, but making the camera simpler to produce, thereby increasing gross profit margins to [*17] a goal of forty percent. The Pronto! body was one piece of precision plastic molding which required only a single screw. It did not have the SX-70 through-the-lens viewing, but it used SX-70 film. AS early as 1970, Polaroid had received strong signals that Kodak was going to enter the instant market, but Mr. McCune testified that the design, price, and timing of the introduction of the Pronto! would not have been any different without Kodak's entry in the market. In 1976, Polaroid sold 1,788,000 Pronto! cameras worldwide.

In April 1976, Kodak introduced its infringing EK-4 and EK-6 cameras in Canada. In response to the Pronto! price, Kodak changed the introductory U.S. retail prices for these hard-body models to bracket the Pronto!. The non-motorized EK-4 was priced slightly below and the motorized EK-6 slightly above the Pronto!. However, net dealer prices positioned the EK-6 at about the same price as the Pronto! and the EK-4 about \$ 10 below. Kodak cameras were boxier and heavier than the Pronto! and the EK-4 required the user manually to eject the picture by turning a hand-operated crank. The cameras were moderately successful; Kodak sold 501,500 EK-4s and 610,000 EK-6s in 1976 [*18] despite some negative reports in the press about picture quality. Still, with only one month's head start, Pronto! far outsold EK-4 and EK-6 in 1976.

Kodak initially priced its instant film, PR-10, only three cents lower than SX-70 film despite the fact that PR-10 did not contain a battery and, thus, compared to Polaroid film, was overpriced. PR-10 produced a rectangular picture with rounded corners compared to the square SX-70 prints. In addition, Kodak prints had matte finish as opposed to the glossy finish of the Polaroid

prints. As with the SX-70 film, Kodak experienced initial quality problems, particularly fading.

In 1977, the instant photography business continued to grow rapidly and the competition between Polaroid and Kodak intensified. In March, Kodak announced the upcoming May introduction of the EK-2 model, which came to be commonly known as the "Handle."⁴ The Handle was a fixed focus camera that required no special optical mirrors to direct the light path. This design reduced cost, weight, and the chance of consumer error. Like the EK-4, the Handle featured a manual crank to eject the picture. Kodak priced the Handle at \$ 26.98 dealer low net expecting product-feature [*19] parity with Polaroid models. However, the Handle announcement had the effect of a "bombshell" at Polaroid. (TR 218).

4 The EK-2 was known as the Handle because of its configuration which gave the user a handle to hold with one hand while using the other hand to steady the camera and press the shutter button.

Work on a low-priced camera had begun before the Handle announcement and Polaroid was able to respond by bringing the OneStep, a fixed-focus version of the Pronto!, to the U.S. market in June. It was dealer priced at \$ 28. The OneStep, which Polaroid produced in about three months time at a capital cost of only \$ 250,000, was its best selling camera ever. Contrary to Polaroid's claims that the simple OneStep hurt the quality image of instant photography, a 1978 study of OneStep owners concluded that "Onestep owners expressed the highest satisfaction level of any owners ever surveyed." (DF 20,687).

The instant camera market exploded in 1978. Polaroid's worldwide amateur camera sales increased approximately [*20] thirty-two percent over 1977 levels. Both companies accumulated significant backorders for cameras; Mr. McCune reported to the Polaroid Board of Directors several times during that year that demand was exceeding supply for both cameras and film. Despite all of this selling activity, however, the new integral era was not as profitable as the pack camera era had been. Mr. McCune reported that although sales had increased sixty-eight percent over 1968 pack-era levels, profit was only seventy-one percent of what it had been. (PT 2082). Polaroid executives blamed this loss of profit on Kodak's competitive presence which they claimed prevented them from increasing prices.

From May 1977 to July 1978, Kodak gradually lowered its price to dealers on the Handle by offering dealer rebates and bonus discounts such as introductory specials. In July 1978, Kodak was selling Handles to dealers at cost, about \$ 18.95. Although the Kodak camera was

non-motorized, Polaroid executives testified that they felt compelled to bring prices down on both their motorized and folding cameras.⁵ Polaroid lowered the price of the SX-70 by \$ 25.50 and offered the Pronto Rangefinder, the fanciest camera in the [*21] Pronto line, at \$ 15.50 less by removing the tripod mount and the timer.

5 The question of whether Polaroid would have made these price cuts without Kodak is addressed in Part III, Section B, 2(a).

Sales began to slow in 1979. I. McAllister Booth, Polaroid's then Vice President in charge of manufacturing, testified that retail prices were off, the earlier projections were not holding true, and Polaroid dramatically changed its expansion plans to avoid building inventories that would not be sold. Although first quarter sales increased about ten percent, by October, Mr. McCune reported that sales for the year were essentially flat. Although sales were still at a high level -- the second highest in Polaroid history -- Polaroid had planned for the continued, explosive growth rate of 1978. As a result, the company had to make costly reductions in its production schedule. Approximately 800 workers were laid off and the construction of additional production facilities was halted.

Kodak was faring much worse. Even [*22] by 1979, Kodak had not turned a profit on its instant business. Although Kodak had anticipated a negative cash flow in the beginning years, it did not expect the turnaround to be so slow. In 1980, when Kodak executives examined the diminished demand and market studies which indicated that no relief was in sight, they considered abandoning the instant business. However, while in the throes of this fast-paced competition, Kodak introduced three new models in 1979, only one of which represented a significant price cut. The non-motorized Handle 2 was packaged with a case at a net dealer price of \$ 19.95 and shelf price of \$ 22.95. In late 1979, that price was lowered to \$ 17.95. The other two models were priced at or above the Onestep. The CB50, a motorized camera, was dealer priced at \$ 26.95. The CB250 was more in the mid-range; it had a built-in strobe and a shelf price of \$ 54.95.

In early 1980, Polaroid introduced a significant innovation: Time Zero film, which reduced the ex-camera development time by half. Dr. Land had always dreamed of truly instant pictures. Indeed, his goal was a photograph that emerged from the camera completely developed. Mr. Booth testified, however, that [*23] the urgency propelling Time Zero to market in early 1980 was Dr. Land's insistence on Polaroid's need to compete better with Kodak, "to beat Kodak." (TR 2198). Time Zero caused a drain on the company's resources and forced other projects to the back-burner. But Mr. Booth testified

that he believed that without Kodak in the market, Time Zero film would never have been developed. Instead, Polaroid would have focused its efforts on the Sun camera series and brought them to market earlier.

Polaroid sold the most film in its history in 1980. Camera sales, in contrast, continued to decline as did their profitability. Polaroid introduced "The Button" camera in August 1980, but it was nothing more than the Onestep with a new finish, priced about \$ 10 less. Between 1977 and 1980 the margin on the Onestep decreased fifty percent. The margin on film remained the same but during this time period, the price of SX-70 film, in constant dollars, actually declined from \$ 4.64 to \$ 4.06.

Both Kodak and Polaroid recognized that the key to increasing profit in this period was to raise prices but were apprehensive about how price increases, especially on film, would affect demand. While mindful of the [*24] keen competition within the instant camera market, both companies were increasingly concerned with the growing threat of conventional 35mm photography and advances in photofinishing quality and speed. Polaroid began studying the 35mm photofinishing business in 1979. By the early 1980s, 35mm photography had dropped in price so as to compete directly with instant photography. In 1981, Mr. McCune asserted that, "I think we could all agree that our major competition comes from conventional photography -- not Kodak instant. It is 35mm sales that have grown at the expense of instant." (DF 61,742). In 1981, Mr. Booth reported to Polaroid's Board of Directors that the relative price of instant and conventional prints was a major concern. He reported that anything more than a five percent increase in film price would widen the "already high" two-to-one ratio between the price of an instant and conventional print.

The introduction of Time Zero film gave Polaroid the chance to raise film prices by six percent in March 1980, double the usual annual increase of three percent. This increase followed a Kodak increase in January 1980. In January 1981, Kodak again increased its film prices, this [*25] time by almost ten percent. Polaroid followed Kodak's lead in February. During this time period, Kodak also began to concentrate its efforts on the premium channel of distribution, selling cameras to companies for use as promotional incentives or prizes. These cameras were sold at a considerable loss to Kodak and generated few film sales.

Polaroid introduced its Sun series of cameras and film in June 1981. The cameras were Polaroid's first models with built-in flash. In combination with the high-speed film, the Sun cameras allowed shorter exposure times, extended indoor flash ranges, and had a smaller

aperture opening, which improved the photograph's depth of field. The Sun 660, with state-of-the-art automatic focusing, was dealer priced at \$ 62.50. The 640 model, without automatic focusing, had a dealer price of \$ 46.50. Unfortunately, in 1981 and 1982, Polaroid sold only half the number of Sun cameras predicted. 1981 was the first year that Polaroid had an overall negative gross margin on camera sales.

Kodak introduced a new series of its own in 1982. The Kodamatic series included Kodak's lowest-priced camera to date, the Kodamatic Champ, which had a dealer price, after rebates, [*26] of \$ 19.95. Three other cameras Kodak introduced at this time were priced in the mid-range. The top of the line was the auto-focusing Kodamatic 980L which, after rebates, sold to dealers at \$ 74.45. The Kodamatic 960 low net price was \$ 49.95 and the 970L was \$ 59.95. Kodak continued to offer special discount programs to its dealers which lowered these prices somewhat.

In March 1982, Polaroid introduced the lower end of the Sun series line with the Amigo/620, dealer priced at \$ 37.75. Due to disappointing sales and allegedly to meet the competition from the Kodak Champ, Polaroid decided it had to lower prices further. Later that year, Polaroid simply changed the name of the 640 camera to the Sun 600 LMS, the 660 camera to the Onestep 600, and lowered the price by twenty dollars. Not surprisingly, negative margins increased and losses continued. Sales did not increase. Kodak introduced the last in the Kodamatic series in March 1983; the 940 had a dealer low net of \$ 31.50.

Although the demand for film was significantly less than either Polaroid or Kodak had expected, film margins remained satisfactory and even increased slightly during this period. The price of Polaroid and Kodak [*27] film was very close throughout the entire infringement period. Professor Dolan, Polaroid's marketing expert, testified that both companies pursued a policy of "parity pricing." (TR 4112). Mr. Booth testified that Polaroid was concerned that Kodak would not follow any price hike initiated by Polaroid. There was conflicting testimony about whether this concern was reasonable given some increases which Kodak premiered. Overall, although the shelf price of film rose significantly during the infringement period, it increased only fifty-nine percent of the rate of inflation as reflected in the Consumer Price Index.

Around 1982, Kodak was taking a hard look at its strategy in the steadily declining amateur business. At first, the company believed that raising prices and offering better quality photographs was the key to success. When the new Kodamatic line failed to produce large sales, and higher film prices reduced demand, Kodak changed its plans, focusing its sales efforts on large vol-

ume users such as insurance companies. Kodak also pulled out of the premium channel, which generated few film sales, and stopped media advertising. From 1983 onward, distribution in consumer channels was [*28] reduced significantly. Eventually, in 1984, Kodak decided to pull out of the amateur market completely. By the time it was ordered to leave the market in 1985, Kodak had lost \$ 600 million on the instant photography business, not including the cost of exiting the market.

Polaroid feared that Kodak would dominate the instant photography field but, in fact, during the entire infringement period, Polaroid maintained the dominant market share for camera and film worldwide. Its lowest worldwide market share for cameras was about fifty-five percent in 1977, but after 1983, it never dipped below sixty-five percent. Its lowest market share for film came in 1980 at about sixty-four percent, but its share topped seventy percent for half of the infringement years.

With a consistently larger market share and more efficient production, Polaroid fared better than Kodak overall. According to Professor Anthony, a Kodak accounting expert, Polaroid lost \$ 82.1 million pre-tax dollars on its instant business from 1976 to 1985. In the years following Kodak's departure, Polaroid has raised its film prices to within about eighty percent of the Consumer Price Index. In 1987, the average unit price for [*29] film went up twelve percent and in 1988 it went up another thirty percent. Not surprisingly, sales of film and cameras decreased in both years. (DF 61,034).

The foregoing overview provides the factual setting for the parties' claims. Polaroid's position is beguilingly simple. It claims that its historical business practices, and the sensible business direction it would have taken, was altered and diverted because it had to respond to Kodak's entry into the instant photography market.

Without Kodak, Polaroid claims it would have continued the growth and profitability it enjoyed in its early pack camera years because of its unique management organization, its innovative style and, above all, the inventive brilliance of its founder and leader, Dr. Edwin Land. Instead, in order to respond to Kodak's entry into the field, it was compelled to alter its usual marketing strategies of introducing lower priced cameras in a systematic and orderly fashion which exploited manufacturing and marketing efficiencies. Aware of Kodak's price-cutting policies and practices, and Kodak's enormous power in the entire photography field, Polaroid claims it was not free to price its products at levels which [*30] would have brought it into line with its historical margins. Polaroid claims that Kodak forced it into a fierce price war which was inimical to its traditional style, and, as importantly, to its image as the innovative, inventive leader in instant photography.

Polaroid also claims it was damaged by what it describes as Kodak's "trashing" or trivialization of instant photography. Because Kodak entered the market with only a lower priced camera, not competing at the higher SX-70 camera level, its advertising, marketing, and pricing practices encouraged consumers to look at the instant camera as a toy or a gimmick, designed mainly for parties or festive occasions, rather than the camera of the future -- a camera which, according to Dr. Land and other Polaroid marketing executives, would eventually replace the conventional camera because it could produce photographs of equal quality with no waiting period. "Why wait?" was Polaroid's marketing theme.

Polaroid seeks to recover lost profits it would have earned in the world without Kodak, the "but for Kodak" world, during the period it would have enjoyed a lawful monopoly, 1975 through early 1991, when the final Polaroid patent would have [*31] expired. ⁶ Under its Panduit analysis, Polaroid claims that it would have made each of Kodak's camera sales and each of Kodak's film sales at an incremental profit, albeit at different prices and in a different time frame. In addition, citing its traditional reluctance to grant a license to a competitor, the presumptive validity of the infringed patents, and the bright future for its product as the basis for its negotiation posture, Polaroid seeks, in the alternative, a reasonable royalty rate which approximates its lost profits.

6 While Kodak does not dispute that Polaroid is entitled to demonstrable lost profits for the period following the injunction, that is, from January 8, 1986 through 1990, Kodak asserts Polaroid is estopped from making that claim because it had never indicated in pre-trial proceedings that it intended to pursue that claim and had resisted discovery. I denied Kodak's motion to bar Polaroid's claim for that period because I found the record adequately alerted Kodak to the full extent of Polaroid's claim.

[*32] Not surprisingly, Kodak presents an entirely different perspective on compensable damages and a reasonable royalty rate. On lost profits, while not conceding that Panduit is the established formula for determining damages, Kodak's position is that even when the Panduit formula is used, the result is a much lower award than Polaroid claims. Kodak takes the position that Panduit does not create a legal presumption that the demand and market for instant products would have been identical in a world without Kodak, but that Polaroid must prove actual demand for instant photography and not simply add up the total sales by both companies. Kodak also argues that its contribution to the creation or expansion of the market must be considered. Even in a two-supplier market, Kodak asserts, Polaroid must prove that

it could have made the infringing sales. Kodak questions whether a separate market for instant photography exists and argues that any analysis of the market must include the impact of conventional photography. Kodak claims that Polaroid's track record of corporate planning and management ability, together with the financial resources available to it, shows that Polaroid [*33] would not have made the decisions necessary to expand its manufacturing and marketing capacities. And even if Polaroid increased manufacturing capacity substantially, it would have done so at greater costs than it now presents and at a much lower profit than it now posits. Kodak also argues that any profits that are awarded for the infringement period are taxable at the tax rates applicable at the time they would have been made.

Kodak presents several analytical methods of determining a reasonable royalty, and, needless to say, its analysis results in startlingly different figures than those proposed by Polaroid. Kodak traces the history of licenses in the photographic field and examines the history of licenses between Kodak and Polaroid to arrive at its submission of a reasonable royalty rate in this case. Finally, Kodak disputes strenuously Polaroid's request for treble damages and attorneys' fees.

As stated earlier, the objective of this phase of the litigation is to fairly compensate Polaroid for the injury caused by Kodak's infringement. Of all the approaches suggested, Panduit initially presents the clearest roadmap to lost profits. It is a step-by-step, quantifiable [*34] method for arriving at a rational, comprehensive, and fair result and is the preferred approach in this case if it results in a fair award. A reasonable royalty rate alternative is unnecessary if Polaroid can prove lost profits. I begin my analysis by setting out my evaluation of the facts and figures in the case to arrive at lost profits. If the result is not satisfactory in light of the objective to fairly compensate Polaroid, I will turn to a reasonable royalty rate as the alternative.

III. THE INSTANT PHOTOGRAPHY MARKET

A. Absence of a Non-Infringing Substitute

Legal Principles and Factual Findings and Conclusions

B. Relationship Between Marketing and Demand in the Market of Instant Photography

Legal Principles and Factual Findings and Conclusions

1. Incredible Shrinking Market Without Kodak, According to Kodak

a. Kodak Sales Attributable to Kodak Name and Kodak Features

Name

Features

Quality

b. Kodak Sales Attributable to Kodak Distribution, Sales Force and Dealer Support

U.S. Distribution

Sales Force and Dealer Relations

International Distribution

Premium Sales

c. Kodak Sales Due to the [*35] Effect of Two Competitors Advertising and Promoting Instant Products

d. Evidence of Market Expansion

2. The Market of the Future, According to Polaroid

a. Polaroid's Historical Pricing Behavior

b. Effect of Higher Prices in Instant Photography Market

This section examines the nature of the instant photography market in order to assess what the demand for instant products would have been in the absence of Kodak's infringement. It includes an examination of whether any non-infringing substitutes for instant photography existed during the infringement period and also considers the effect of competition from conventional photography. It considers whether Kodak's entry expanded the demand for instant products and whether Polaroid had the marketing capability to create and exploit existing demand. Finally, this section concludes with a discussion of the probability and the potential impact on the market of the actions Polaroid claims it would have taken in a Kodak-free world, namely, if it had delayed introducing certain products and charged substantially higher prices.

A. The Absence of a Non-Infringing Substitute.

Legal Principles

[*36] In order to recover lost profits the patent owner must show a reasonable probability that but for the infringement it would have made the sales that were made by the infringer. Del Mar Avionics, Inc. v. Quinton Instrument Co., 836 F.2d 1320, 1326 (Fed. Cir. 1987). An integral step in determining whether the patent owner could have made the infringer's sales is to discover whether, during the infringement period, any non-infringing substitutes for the patented product were

available which possessed "all the beneficial characteristics of the patented device." TWM Mfg. Co. v. Dura Corp., 789 F.2d 895, 901 (Fed Cir.), cert. denied, 479 U.S. 852 (1986). The inquiry is quite narrow; acceptable substitutes are those products which offer the key advantages of the patented device but do not infringe. Central Soya Co. v. Geo. A. Hormel & Co., 723 F.2d 1573, 1579 (Fed. Cir. 1983). Mere existence of a competing device does not make that device an acceptable substitute. *Id.*; TWM Mfg., 789 F.2d at 901. In markets where non-infringing alternatives [*37] are available, the court must determine what portion of the purchasers of the infringing product would have purchased the substitute instead of the patented product. See, e.g., Amstar Corp. v. Envirotech Corp., 823 F.2d 1538, 1543 (Fed. Cir. 1987).

Findings and Conclusions

There is no genuine dispute between the parties on this issue. Both agree that the instant feature is the "beneficial characteristic" of instant photography and that no other suppliers of instant photography existed in the market.⁷ (See Polaroid's Post-Trial Submission at Facts-I, at 19; Kodak's Post-Trial Submission at Facts (Topic I), at 8, n.10). However, there is substantial dispute between the parties concerning the extent to which conventional photography influenced the demand for instant photography and the extent to which that influence may be considered in light of the finding that conventional photography was not an acceptable non-infringing substitute during the infringement period.

7 This is not true in Japan, where Fuji began selling instant cameras and film in 1981.

[*38] At various times during the trial Polaroid seemed to argue that all evidence about conventional photography should be excluded because conventional photography was not an acceptable substitute for instant photography. (See, e.g., TR 6699-702; 11134-35). Kodak argued that conventional photography was an "economic substitute" for instant. (Kodak's Post-Trial Submission Facts (Topic I), at 8, n.10 and Law (Topic I), at 7, n.5). Kodak did not attempt to quantify the number of Kodak instant purchasers who would have turned to conventional products in Kodak's absence; Kodak simply urged that the relative price of instant and conventional photography was a significant variable in the demand formula for instant products and therefore must be considered in any assessment of the market. (TR 11134-35; 11312-15).

Instant photography occupied a unique niche in the overall photography market during the infringement period. Consumers sought the emotional "instant experience" of having a picture develop immediately, usually in the presence of the subject. (See e.g., PT 2409, PT

2454, and discussion in Section B, Part 1(a)). Although instant photography was unique, it did not exist in a vacuum; [*39] it also competed with conventional photography for the consumer's photographic dollar. (See discussion in Section B, Part 2(a) and (b)). Those who purchased infringing Kodak instant products at Kodak prices would not have considered conventional products as an acceptable substitute at the time of purchase, but the relationship between the relative advantages of conventional and instant photography was an integral part of each consumer's decision. If Polaroid were simply claiming that it could have made Kodak's sales at the same time at similar prices, there would be no question in my mind that consumers would have made the same choice vis-a-vis conventional photography. However, Polaroid's claim is not so simple.

Polaroid's experts spun a scenario in which the prices Polaroid would have charged were substantially higher and in which, through a complicated massaging of the demand curve, the great bulk of sales would have occurred later than they did historically. In this "but for" scenario, the effect of conventional photography on the instant photography market must be considered. The evidence of competition between instant and conventional products is overwhelming. Even Polaroid's [*40] econometric expert attempted to include the effect of competition from conventional photography in his computation. The relative values of instant and conventional changed throughout the period of infringement. On the facts before me, I must consider that relationship when deciding whether Polaroid's scenario, which differs so substantially from the historical world, is feasible.

Contrary to Polaroid's urging, the law does not require this Court to ignore the effect of competitive forces on the market for patented goods just because there are no non-infringing alternatives. Indeed, the law requires a careful assessment of all market influences when determining lost profit or reasonable royalty damages. State Indus., Inc. v. Mor-Flo Indus., Inc., 883 F.2d 1573, 1581 (Fed. Cir.), reh'g denied, 1989 U.S. App. LEXIS 14711 (Fed. Cir.), reh'g denied en banc, 1989 U.S. App. LEXIS 16954 (Fed. Cir. 1989), cert. denied, U.S. , 110 S. Ct. 725 (1990) (although fiberglass was not a non-infringing alternative to the [*41] patented foam insulation, the two were in direct competition and therefore, it was in the district court's province to consider that fact in assessing the appropriate reasonable royalty rate); Water Technologies Corp. v. Calco, Ltd., 850 F.2d 660, 673 (Fed. Cir.), cert. denied, U.S. , 109 S. Ct. 498 (1988) (as a basis for reversing the district court's award of lost profits, the court held that a finding of but/for causation was negated by the finding that the patentee's price significantly exceeded that of the infringer); Paper Converting Mach. Co. v. Magna-Graphics Corp., 745 F.2d 11, 21

(Fed. Cir. 1984) (in considering the magnitude of demand in a two-seller market, the court upheld the district court's consideration and rejection, on factual grounds, of the infringer's claims that consumers of the patented product would have foregone the purchase except for their lower price); Pfizer, Inc. v. International Rectifier Corp., 218 U.S.P.Q. 586 (C.D. Cal. 1983) (in deciding what demand would have been for certain prescription drugs in the absence of infringement, the court considered price [*42] and demand elasticities and competition from other non-infringing drugs).

I find that conventional photography was not an acceptable substitute for instant photography during the period of infringement. Competition between conventional and instant photography (which changed throughout the ten years of infringement) did, however, affect the price that consumers were willing to pay for instant photography. Therefore, in Section B, Part 2, I have assessed what effect the competition would have had on Polaroid's ability to charge more for its instant products and on the profitability of delaying the introduction of certain lower-priced products.

B. The Relationship Between Marketing and Demand in the Market for Instant Photography.

Legal Principles

On its face, the inference that in a two-seller market, but for the infringement, demand for the patented product equals the combined sales of the patent owner and the infringer seems reasonable. Lam, Inc. v. Johns-Manville Corp., 718 F.2d 1056 (Fed Cir. 1983). The rationale supporting this inference is the idea that when the infringement was occurring, the combined sales represent the number of consumers [*43] who desired the patented product. See Livesay Window Co. v. Livesay Indus. Inc., 251 F.2d 469, 473 (5th Cir. 1958).

The law looks behind the facial appeal, however, and requires more of the patentee. The patent holder must show that it had the marketing capability to make the sales. State Indus., 883 F.2d at 1577; Datascope Corp. v. SMEC, Inc., 879 F.2d 820, 826-27 (Fed. Cir.), reh'g denied en banc, 1989 U.S. App. LEXIS 13416 (Fed. Cir. 1989), cert. denied, U.S. , 110 S. Ct. 729 (1990). Typically this requires proof of factors such as an adequate distribution system and sales personnel. See, e.g., Datascope Corp., 879 F.2d at 827 (upholding the district court's determination that the patentee was not entitled to lost profits on infringer's foreign sales of heart catheters because patentee had no sales representatives assigned to foreign customers and never made "inroads in the area"); Yarway Corp. v. Eur-Control USA, Inc., 775 F.2d 268, 276 (Fed. Cir. 1985) [*44] (upholding the district court's decision to award the patentee profits on

only eighty-five percent of the infringer's sales of desuperheaters because of court's finding that some buyers might not be aware of the patentee and thus not purchase from it). This factual inquiry is consistent with the role of marketing in markets where demand is relatively inelastic or dependent on variables outside the seller's control, such as the rate of new construction or population growth. See [Ryco, Inc. v. Ag-Bag Corp.](#), 857 F.2d 1418, 1427 (Fed. Cir. 1988). In those situations marketing has a dual purpose: to make the availability of the product known and then a sort of "clean up" operation to get the product to those who need it.

Kodak claims that demand and marketing in the instant photography market are not as neatly severable as in the recorded cases. It claims instead that determining demand in the absence of infringement requires a careful examination of the parties' actual marketing capabilities. I agree.

In this respect, the instant photography market may be unique. Instant cameras are discretionary luxury items usually purchased as gifts. (TR 8043-46). Therefore, sales [*45] are highly susceptible to the influences of marketing: advertising, name and reputation, product design strategies, in-store promotion and demonstration. (TR 8039-42; 8046-47). Consumers are motivated both by the invention itself and its marketing. Answering the question of how many of Kodak's sales Polaroid would have made depends, in part, on determining what unique marketing influences, if any, Kodak brought to bear on the marketplace. Potential influences include the Kodak brand name, advertising, any unique product or service offerings, as well as such garden variety marketing topics as distribution channels and the level of sales support. To simply assume, as Polaroid urges, that the demand for instant products absent Kodak's illegal entry would be the total sales actually made by both companies is analytically flawed, for it fails to consider why consumers purchased instant cameras and ignores the unique facts of this case.

The Federal Circuit has recognized that limited marketing capability may curb an award for lost profits, but has not discussed it in terms of stimulating demand. [*46] [Datascop Corp.](#), 879 F.2d at 827; [Yarway Corp.](#), 775 F.2d at 276. Even the parties basically agree on the critical topics; they just do not agree whether the focus should be on Polaroid's marketing capability or Kodak's expansion of demand. (See exchange at TR 4319-20). Polaroid believes the appropriate marketing capability topics are products, pricing, advertising and promotion, and distribution. (Polaroid's Post-Trial Submission Facts-II, at 5-14). Kodak believes that the means by which it expanded demand were name and reputation, marketing efforts, product variety and features, advertising and promotion, sales force, dealer support, and distribution.

(Kodak's Post-Trial Submission Facts (Topic II), at 1). For the topics common to both parties, it is only a question of semantics: do these factors stimulate or facilitate purchases? In either case, if Kodak offers something unique and critical to those purchases, Polaroid cannot prove lost profits on those sales.

I would like to emphasize that it is not a question of whether Kodak's marketing acumen was better than Polaroid's or whether consumers preferred Kodak to Polaroid. It is a question of [*47] whether any unique Kodak marketing influence was essential to significant consumer interest in instant photography. Only in that case can it be said that demand would be diminished in Kodak's absence.

The main dispute between the parties on this issue is over the extent to which the effect of Kodak's name and reputation on the market may be considered in determining what sales Polaroid could have made absent the infringement. Polaroid argues that customer brand preference is irrelevant to the question of demand. [Datascop Corp.](#), 879 F.2d at 825. I disagree with this reading of [Datascop Corp.](#) [Datascop Corp.](#) involved the sale of a heart catheter, which, through the operation of a percutaneous balloon, allowed doctors to clear blocked arteries. [Datascop Corp. v. SMEC, Inc.](#), 594 F. Supp. 1306 (D.N.J. 1984), aff'd in part and rev'd in part, 776 F.2d 320 (Fed. Cir. 1985) (infringement). Before this invention, doctors were required to insert catheters through surgery which required more time, more anesthesia, and caused the patient more pain than with the percutaneous method. [Datascop Corp. v. SMEC Inc.](#), 678 F. Supp. 457, 459-60 (D.N.J. 1988), [*48] aff'd in part and rev'd in part, 879 F.2d 820 (Fed. Cir. 1989) (damages). The district court held that early in the infringement period, many of the infringer's sales were made because of doctors' confidence in the president of the company and that many of the infringer's customers would not have switched from using surgical balloons to percutaneous balloons but for that faith in the infringer's president. [Datascop Corp.](#), 678 F. Supp. at 459-60. The court held that the patentee was not entitled to lost profits and instead awarded a reasonable royalty. [Id.](#) at 462-64.

The Federal Circuit reversed this finding not because it found customer preference to be irrelevant to the question of demand, but rather because it found it irrelevant to the question of marketing capability. [Datascop Corp.](#), 879 F.2d at 825. The circuit court explained that if customer preference were relevant, it would be relevant to the question of demand:

The question at this point in the appeal, rightly stated, is whether [the infringer's] showing that the loyalty of some of its customers overcame the reasonable inference (when the patentee [*49] and the infringer are the only

suppliers of the patented product) that the patented owner would have made the sales made by the infringers. It did not. The district court found, and [the infringer] does not challenge the finding, that those sales would have been made by [the patentee] (albeit later): "Regardless of the doctors' high regard for [the infringer's president and the infringer], these doctors would have adopted the percutaneous method because of [its] advantages [over prior art methods]."

Id. at 826 (citations omitted). In other words, the court is saying that preference may be relevant to demand but because of the advantages of patented invention over prior art the court had already determined that demand equalled the combined sales of the patentee and infringer. In medical science, an undisputed improvement is inevitably adopted. The nature of this special market made customer loyalty, which may have existed when the invention was new, inconsequential.

In our case, demand is much more complex. Instant photography is unique but it cannot be compared to an inevitable next step in medical science. Demand for instant products did not depend [*50] on an independent variable, such as the number of blocked arteries. Like the demand for other mass market consumer goods, the demand for instant photography was subject to the whim of consumers who, in deciding where to spend their discretionary income, may have been influenced by brand name. I believe Datascope compels this Court to examine whether loyalty to the Kodak brand name can overcome the otherwise reasonable inference that consumers bought instant cameras because of the patented features owned by Polaroid.

Polaroid argues that if this Court is allowed to open the inquiry to include the effect of Kodak's marketing efforts on demand, and if the infringer enjoyed established marketing clout, few, if any, patentees would be entitled to lost profits. I do not believe this is so. First, the patent owner is only required to prove the reasonable probability that it would have made the sales. The patent owner need not prove causation as a certainty, nor must it negate every possible purchase of another product. See, e.g., Water Technologies Corp., 850 F.2d at 671; [*51] Gyromat Corp. v. Champion Spark Plug Co., 735 F.2d 549, 553 (Fed. Cir. 1984); Lam, Inc., 718 F.2d at 1065. Moreover, when the amount of damages cannot be ascertained with precision (in the present case because it is impossible to sort out the various effects on the marketplace), any doubts regarding the amount must be resolved against the infringer. Story Parchment Co. v. Paterson Parchment Paper Co., 282 U.S. 555, 563 (1931). The infringer's marketing clout must be significant and critical in order to overcome this protection.

Second, demand is not a function of marketing in every case. Where the two are intimately related, however, I believe the parties' relative capabilities must be assessed in order to determine what the patent owner has lost as a result of the infringement. The Federal Circuit has considered a price differential between the patented goods and the infringing goods as relevant to demand even when there were only two suppliers of the patented good. Water Technologies Corp., 850 F.2d at 673; Paper Converting Mach. Co., 745 F.2d at 21. The same reasoning applies in this [*52] case to any differences in marketing capabilities.

Of course, if a patentee's product is infringed by a company with unique marketing capabilities, in a market where demand depends, to some extent, on those abilities, the patentee is still entitled to damages. Although the award of lost profits is the preferred measure of damages, where lost profits cannot be proven, the patentee is not left out in the cold but is entitled to a reasonable royalty, sufficient to compensate for the infringement. Fromson v. Western Litho Plate & Supply Co., 853 F.2d 1568, 1574 (Fed. Cir. 1988); Stickle v. Heublein, Inc., 716 F.2d 1550 (Fed. Cir. 1983).

It is impossible to prove what purchasers of Kodak instant cameras would have done in a world without Kodak; it is not Polaroid's burden to do so. Polaroid must show, however, that a reasonable probability exists that those consumers would have purchased Polaroid cameras. To determine whether Polaroid could make those sales, I must examine why they purchased Kodak. That inquiry necessarily entails an exploration [*53] of the effect of Kodak's marketing efforts. While Kodak's entry may have been critical to a few sales here and there, I find that it was not critical to most.

Factual Findings and Conclusions

Introduction: The Parties' Factual Claims About Demand and Marketing Capability

Kodak claims that its market entry triggered the boom in instant photography and that competition from conventional photography touched off its decline. Kodak bases this claim, in large part, on Professor Baumol's econometric model, which attempts to explain and quantify the various forces at work in the market. Kodak concluded that its presence expanded the market by about seventy-five percent. Kodak's reputation, product offerings, advertising, sales efforts, and distribution were the reasons for this market expansion, Kodak concluded.

I will analyze these claims in reverse order. In Part 1, I will first determine whether there is any evidence that some offering unique to Kodak brought a significant number of consumers into the market. The parties' rela-

tive marketing capabilities are a part of this analysis although, depending on the topic, the nomenclature of economics is not always appropriate. Having [*54] examined any mechanisms by which Kodak may have expanded the market, I will review Professor Baumol's model and other evidence of market expansion offered by Kodak.

Although Polaroid claims that it could have made all of Kodak's sales during the infringement period, it believes the demand would have looked entirely different without Kodak. Demand would not have peaked in 1978 but would have grown more slowly and, by 1990, Polaroid would not only have sold every camera Kodak sold from 1976 to 1985, but would have sold both these additional cameras and every Polaroid camera historically sold at significantly higher prices. This conclusion is based largely on Professor Fisher's econometric model which sought to measure the effects of certain market variables. Professor Fisher used this model not only to explain but to predict what sales would have been without Kodak, given various sets of prices and camera model introduction dates. His conclusion was that but for the infringement, Polaroid could have made a profit, with interest, of over \$ 3.9 billion dollars.

In Part 2, I will examine Professor Fisher's model for its soundness and reliability and I will consider whether Polaroid's [*55] pricing and introduction decisions would have happened as he and other Polaroid witnesses testified. I will also assess the effect of such decisions on the market and on Polaroid's potential profits.

1. The Incredible Shrinking Market Without Kodak, According to Kodak

I believe that the law requires this Court to address the question of whether Kodak contributed something unique to the market such that without Kodak, consumers would not have purchased instant photography. As demand for instant photography is heavily influenced by marketing, one way in which this question can be narrowed is to ask: Can any factor be identified that was both unique to Kodak marketing and critical to consumers' desire to purchase an instant camera? From this flows a discussion of the Kodak name and reputation and Kodak product features in Section (a).

The same question in a different form is whether Kodak's distribution in the United States and abroad was critical to the sales made through those channels. Could Polaroid have made those sales? Were Kodak's salespeople and their relationship to dealers critical or merely incidental to sales? This is the more typical marketing capability analysis [*56] and is covered in Section (b).

In Section (c) I will consider the effect of Kodak's advertising and promotion. This inquiry differs slightly

from the first two because instead of claiming that its advertising was unique, or that its in-store promotions were geared differently, Kodak simply claims that two competitors can stimulate demand better than one, even if the total amount and type of advertising is the same. Kodak claims that the "hype" created by its market entry expanded consumer desire for instant photography and could not have been duplicated by Polaroid.

Lastly, in Section (d), I examine the evidence offered by Kodak to show that its presence expanded the market. I consider both Professor Baumol's models and the other empirical evidence that Kodak offered to show market expansion.

(a) Kodak Sales Attributable to the Kodak Name and Kodak Features

Kodak claims that many customers were drawn to instant photography because of the unique features it offered, namely, Kodak camera and film attributes, Kodak quality, and the Kodak name. While it may be true that some consumers preferred Kodak, this Court must determine whether these product features were critical and [*57] necessary to significant consumer interest in instant photography. Such a finding requires examination of the statements and actions of instant photography purchasers in the mid-1970s and early-1980s in order to see what motivated their purchases.

The overwhelming reason consumers purchased instant cameras during the infringement period was because of the instant feature. Study after study confirmed this. For example, a 1977 survey of 357 instant camera owners found that the top three reasons for getting an instant camera were the same whether one purchased Kodak or Polaroid: seventy-seven percent of Kodak purchasers said they chose the convenience of having pictures immediately; sixty-nine percent of Polaroid purchasers agreed. The other top two reasons -- knowing almost immediately whether the picture turned out and the convenience of no processing -- also stem from the instant feature. (PT 2454).

The reasons for purchasing instant cameras did not vary depending on which brand consumers ultimately chose. One 1981 Kodak study of about 1000 instant picture-takers was summarized by Kodak:

Picture-takers see instant as instant, not "Kodak-instant" and "Polaroid-instant." Thus, [*58] the fundamental attractions and barriers for acquiring and using a Kodak instant are no different from those for a Polaroid instant camera. Likewise, picture-takers' basic attitudes toward, perceptions of, and positioning of instant apply to the category as a whole and exhibit no meaningful brand-related differentiation.

(PT 2409). These studies, and other evidence consistent with their conclusions, have convinced me that, overall, Kodak did not offer the consumer something unique and critical to her decision to purchase instant.

The Kodak Name. Professor Buzzell, Kodak's marketing expert, testified that Kodak's name and reputation drew many new customers to instant photography -- customers who would not have purchased an instant camera without a Kodak label. He testified that many amateur photographers were loyal to Kodak, many Kodak purchasers were anti-Polaroid and, most importantly, a large group viewed the Kodak name as a "reassurance or risk-reducing mechanism" which legitimized, and therefore made attractive, the instant photography field. (TR 8161). Professor Buzzell based this conclusion partly upon contemporaneous market research which tried to identify why consumers' [*59] bought instant cameras.

There is no doubt that Kodak is a well-known brand and that the Eastman Kodak Company has a fine reputation. There is also no dispute that Polaroid is known the world over as a photographic company of first quality. Were the Kodak name and reputation somehow critical to consumers' decisions to purchase instant photography?

To answer this question, Professor Buzzell cited several small, unstructured studies of Kodak and Polaroid instant purchasers which contained some statements that Polaroid and Kodak were perceived differently and that corporate image influenced the decision to buy instant. However, the record is devoid of any convincing evidence that the Kodak brand name was critical to a meaningful number of consumers who chose instant.

In one such study, Stage One, a marketing consulting group hired by Polaroid, conducted one-on-one in-depth interviews with two small samples of camera owners: thirty-two Onestep/Pronto! owners and twenty-two Kodak Instamatic owners in 1978, and twenty-nine Kodak Handle purchasers in 1979. At most, this study showed that some instant purchasers perceived Kodak and Polaroid differently. Some Kodak buyers thought that Kodak [*60] was more for the "man on the street" and Polaroid did not make cameras "for me." However, this type of random statement conflicted with other findings in the study; for example, both Kodak and Polaroid purchasers gave the same reasons for the appeal of instant photography. (DF 20,776).

Other studies mentioned by Professor Buzzell contained similar conflicts and no conclusive evidence. An October 1976 demonstration tested alternative versions of the Pronto!, EK4, and EK6, and concluded that when ranking the importance of various features in selecting a camera, reliability was rated number one, followed by value for money, simplicity of operation, and ease of use. Brand was considered the least important reason far

choosing a particular camera, followed by appearance, weight, and size.

Professor Dolan, Polaroid's marketing expert, and Professor Buzzell's colleague at the Harvard Business School, also considered the question of whether Kodak's name and reputation were a major structural factor which influenced demand during the infringement period. While he admitted that for some loyal Kodak customers, Kodak's entry was the impetus for purchasing an instant camera, there were not meaningful [*61] numbers of these people. Like Professor Buzzell, Professor Dolan based his conclusions on market research. These conclusions, however, were buttressed with his analysis that the instant camera market did not need legitimizing by a well-known company because Polaroid was also well-known and trusted, especially in the field of instant photography. Moreover, Professor Dolan opined that legitimization is more likely when consumers themselves are unable to judge the quality of the product. This is not the case in the field of instant photography. I agree and adopt Professor Dolan's analysis as confirmation of the fact that the Kodak brand name did not expand demand for instant photography.

Even with its small sample and unstructured methodology, one finding which stands out from the Stage One study is that ninety-three percent of Kodak purchasers had negative impressions of Polaroid. These impressions were mostly based on antiquated notions about Polaroid photography from the pack era; some were derived from direct experience with a Polaroid camera and some from word-of-mouth and news reports. This finding deserves attention because it is consistent with other market research during the [*62] infringement period.

I believe the record supports a finding that some anti-Polaroid animus existed in the marketplace due to largely outdated notions about instant photography. This was not an impenetrable barrier for some consumers, and sixty-seven percent of the Polaroid owners in the Stage One study had negative impressions of Polaroid. For the consumers who were permanently turned off, however, Kodak's entry was critical and represented market expansion. Nevertheless, it is impossible to quantify this effect. Professor Buzzell admitted that the results of the Stage One study could not be applied to the general camera-purchasing public. (TR 8147-49). Keeping in mind that Polaroid is not required to prove that it could have made every sale and that any doubts in this matter must be resolved against Kodak, [Lam, Inc., 718 F.2d at 1065](#), I cannot conclude that any anti-Polaroid animus that existed would have diminished demand in the absence of Kodak's infringement. The same reasoning applies to those sales made to the small number of loyal Kodak-only customers, such as certain Kodak employees. I am sure these customers existed but I do not believe their

numbers are [*63] significant, and, in any event, no reliable evidence was offered to prove those numbers.

Kodak Product Features. Kodak alleges that certain features of its instant photography system expanded the demand for instant products as a category. Polaroid has claimed that the law assumes that demand is due only to the patented invention, but I have previously found that many other factors may influence demand in this market. Here, Kodak claims that physical attributes of its products, along with the patented technology, expanded demand. Kodak also claims product variety in and of itself, expanded consumer interest in the whole product line. As usual, the answer lies in the facts and not in assumptions. I find that one Kodak attribute so transformed the product for certain purchasers that it did expand demand in one market segment. I also find, as I did above when considering the Kodak brand name, that the weight of the evidence shows that it was the instant feature, not Kodak extras, that caused the greatest demand for instant products.

The features that Kodak believes most influenced demand were the shape and finish of Kodak prints, Kodak quality color, and the built-in flash. Kodak [*64] also presented evidence on the handle feature and finishes on certain camera models, but the effect of those features on sales was negligible.

In April 1980, Polaroid commissioned a study of picture alternatives which asked 600 interviewees to choose between two prints and give the reasons for their choice. This study concluded that, a direct comparison of the current square SX-70 and Kodak's rectangular PR-10 shows that the majority of consumers prefer the rectangle. (DF 21,180). The 1974 National Analyst Study found that sixty-nine percent of consumers preferred the matte finish of the Kodak print as opposed to the glossy Polaroid surface. (PT 2458). Neither of these facts compel a conclusion that the Kodak print features influenced demand.

However, Kodak's 1979 introduction of the Colorburst 250, equipped with a built-in electronic flash, did expand demand in one particular market -- Saudi Arabia. There, privacy is of great concern. Instant photography which does not require the public act of developing is desirable. More importantly, religious customs prohibit photographing women outside the home. Therefore, an instant camera without a flash is of little use. When Kodak introduced [*65] the Colorburst model with a flash, the Middle Eastern market exploded. Sales grew from approximately 40,000 cameras in 1979 to over 200,000 in 1980 and 1981. Polaroid introduced its flash model in 1981 and, in 1982, Kodak sales fell to 80,000. Mr. Samper, a Kodak marketing executive, attributed the bulk of Kodak sales in this time to the built-in flash. Professor

Dolan agreed that, given the particular culture and religion of the region, Kodak cameras better met consumers' needs than Polaroid cameras for one or two selling seasons. The evidence does not show that Polaroid could have made these sales later in time. Therefore, I find that Polaroid could not have made all of those sales.⁸

8 I consider the exact amount of lost sales when I consider Polaroid's distribution capabilities in this market. See Section (b).

The same two-year time lag before Polaroid introduced a camera with a built-in flash also existed in the United States and other countries, but in those markets, the built-in flash did not have [*66] the significance or the same transforming quality as in Saudi Arabia. Market research shows that some consumers preferred this feature, but there is no evidence that it was critical to their decision to purchase instant cameras and film.

Kodak Quality. Kodak argues that consumers preferred Kodak picture quality and that this preference was so strong that demand for instant photography would have shrunk without Kodak in the market. This is a narrow issue. Especially for consumers who have made no direct comparison, perceptions of quality are intimately associated with brand name. I have already examined that evidence, however, and found that the Kodak name, and all that goes with it, was not critical to sparking significant consumer interest in instant photography. To the extent consumers associated Polaroid with pack-era technology and Kodak with integral technology, quality was an issue. Again, I have examined the evidence of anti-Polaroid animus. Here, I am only concerned with the narrow question of how "quality" influenced consumers who compared Polaroid and Kodak integral products. The record shows that many Kodak customers did compare, usually at the point of purchase.

[*67] Again, Kodak has done a good job of market research, showing that some consumers, both in the United States and abroad, preferred Kodak quality and cited it as a reason for choosing Kodak. Kodak has not convinced me, however, that consumers were so impressed with Kodak pictures that they would have foregone the purchase of any instant camera had Kodak products been unavailable. Polaroid outsold Kodak in every year of the infringement period, often by a margin of two-to-one. If Kodak pictures were of such better quality to keep some buyers out of the market without them, the opposite sales pattern would be expected.

Conclusion

With the exception of the built-in flash in the Middle East, I find that Kodak's name, reputation, quality, and product features did not expand the demand for instant

photography. Polaroid possessed adequate marketing capabilities in this regard.

(b) Kodak Sales Attributable to Kodak Distribution Sales Force and Dealer Support

Both Polaroid and Kodak recognize that differences in their relative abilities to distribute goods to the market are relevant to determining what sales Polaroid could have made but for Kodak's infringement. Kodak claims [*68] that its distribution strengths expanded the market for instant products, while Polaroid simply sees distribution as relevant to serving demand that already existed. It is difficult to discuss distribution in the nomenclature of economics. For instance, can it be said that because a camera is available in a department store, its mere presence causes a consumer to want the camera? Or is it that the consumer wants the camera but may never act on that desire until it is available in that channel? In either case, because the company not distributing in that particular channel would miss out on the sale, I need not decide that interesting question. For the moment, I am also putting aside the question of the advertising side effects of having products available in any particular channel. That matter will be discussed in section (c).

United States Distribution. Polaroid and Kodak distributed through the same channels in the United States: domestic dealers, catalog sales, military PX stores, food stores, department stores, mass merchandisers, and drug stores. For the first five years of the infringement period, both companies achieved product volume exposure of ninety percent. This [*69] shows that both Kodak and Polaroid reached near total distribution and it was very easy for a consumer to find their products. In 1980, Kodak's product volume exposure began to decline and fell to about sixty-nine percent in 1985. This reflects Kodak's decision to pull back from the amateur market and dealers' decisions to de-stock the number two brand during the market decline. I conclude that Polaroid had full distribution capability throughout the infringement period.

Sales Force and Dealer Relations. Kodak claims that its presence expanded the market, and that it made sales Polaroid could not have, because Kodak employed more salespeople, trained them more extensively, called on its dealers more frequently, and maintained good relationships with them.

During the years of infringement Polaroid had a sales force dedicated solely to selling instant photography. Although the Kodak sales force outnumbered Polaroid's,⁹ and Kodak representatives called on dealers more frequently, Kodak's salespeople were also responsible for selling other products. Professor Dolan testified that only about fifteen percent of Kodak's sales efforts were devoted to instant products. (TR 4027). [*70] Moreover, Polaroid also employed merchandise service

representatives who delivered inventory to retail outlets, arranged stock, and trained counter personnel. Polaroid representatives provided in-store demonstrations of its instant photography system. Polaroid did not do extensive training with its sales force, but it only hired experienced salespeople. Perhaps most importantly, I am not convinced that the frequency and quality of sales calls significantly influenced the number of cameras sold. Indeed, one study concluded that sales clerks were generally neutral about instant products, but when clerks emphasized one brand over another, they more frequently pushed Polaroid. (PT 2413). Polaroid initially experienced difficulties with dealer relations. Beginning with the Focus '71 program, which offered year-end bonuses, payment of freight, and specialty lines, dealer relations strengthened considerably. Polaroid also participated in cooperative advertising where it shared the cost of a dealer's local promotion. In Europe, according to a Kodak document, Kodak's and Polaroid's image differed little, but, because Polaroid offered better financial terms, dealers did not actively push Kodak. [*71] (PT 2484).

9 Note, however, that in some Polaroid subsidiary markets, Polaroid's dedicated sales force was frequently as large or larger than Kodak's sales force. (PT 2515; PT 2487; PT 2494; PT 2499; PT 2505; PT 2521).

I find that Polaroid's initially troubled relationship with its dealers did not make them reluctant to sell Polaroid products in the face of consumer demand. Setting aside the effect of in-store promotion on consumer demand, dealers responded to, and did not create, consumer demand. Kodak had good relationships with its dealers but did not prevent those dealers from de-stocking only Kodak products when demand slackened. After considering all the evidence, I conclude that Polaroid's sales force and dealer relations were fully capable in this regard.

International Distribution. Polaroid and Kodak sold instant products outside the United States through wholly-owned subsidiaries and distributors.¹⁰ All witnesses agreed that it was advantageous to operate through a subsidiary rather than [*72] a distributor.¹¹ Subsidiaries offer more control, are more interested in the company's long term goals, and invest more in advertising. Distributors are independent organizations, usually more interested in short-term profits, and may not advertise as extensively. In sum, subsidiaries make it easier to distribute goods and cultivate demand.

10 Before trial, I ruled that Polaroid was entitled to the damages suffered by its foreign subsidiaries and foreign distributors.

11 Professor Buzzell, Mr. Samper, and Dr. Young, the one-time head of Polaroid's international operations, all agreed. Professor Dolan testified that it was the "conventional wisdom" that having a subsidiary was better but he believed that it depended on whether the market could support one. This issue is only relevant in determining whether Polaroid's lack of a subsidiary in any given market would have prevented it from making sales in a market where a Kodak subsidiary operated. Presumably, at least for Kodak, which sold both instant and conventional products, those markets could support a subsidiary and, in the "conventional wisdom," Kodak had an advantage.

[*73] In most of the large foreign markets such as Canada, France, Italy, West Germany, and the United Kingdom, Polaroid and Kodak operated through wholly-owned subsidiaries. Kodak and Polaroid subsidiaries used the same distribution channels in these countries. Although Kodak had manufacturing facilities in some countries where Polaroid did not,¹² and may have emphasized some channels more than others, I find that these differences did not influence demand. Polaroid opened one of its first foreign subsidiaries in Japan in 1960; Kodak had only a distributor there until 1984.

12 Argentina, Australia, Brazil, Canada, France, Germany, and Mexico.

Outside of the six major markets (Canada, France, Italy, West Germany, the United Kingdom, and the United States) significant differences existed between Kodak's and Polaroid's distribution capabilities, differences which would have led to lost sales for Polaroid in certain markets. Kodak operated thirty-five overseas subsidiaries outside the six major markets, compared [*74] to Polaroid's fourteen. Kodak's subsidiaries were particularly strong in Latin America, the Middle East, and South Africa. Together these three regions accounted for thirty-seven percent of Kodak's international sales. (TR 7947-48).

In 1979, Kodak operated nine subsidiaries in Latin America where Polaroid had only two. Kodak outsold Polaroid in this region, capturing sixty-five percent of the camera market and sixty-eight percent of all film sales during the infringement period. Polaroid experienced particular difficulty with its distributor in Mexico who teetered on the verge of bankruptcy in the early 1980s. For these reasons, I find that Polaroid did not have the capability to make all of Kodak's sales in this region. Considering all the evidence on this point, I conclude that Polaroid would have made thirty percent of Kodak's sales in Latin America.

Kodak's presence was stronger in the Middle East as well. Polaroid only had distributors in this region whereas Kodak had four subsidiaries in the major markets of Iran (until 1979), Lebanon, Egypt, and Dubai. Kodak's operation in Saudi Arabia employed six people. In Dubai, Polaroid could not sell through Kodak distributor-owned [*75] outlets. Polaroid had problems with its distributors in this region, too. Not surprisingly, Kodak captured the larger market share in the Middle East, selling fifty-six percent of all cameras and sixty-one percent of all film. Considering that Kodak also expanded demand in the Middle East, particularly Saudi Arabia, by introducing the built-in flash two years before Polaroid, I conclude that Polaroid could only have made ten percent of Kodak sales in this region.

Protesting the government's policy of apartheid, Polaroid stopped selling products in South Africa in 1976. Kodak continued to sell in South Africa until 1987. Polaroid would not have made any of Kodak's sales in this region.

Premium Camera Sales. The premium channel is a method of selling goods to organizations that use the goods as gifts, incentives, or bonuses. Kodak was very active in the premium channel, both in the United States and abroad, beginning in 1977. During the entire infringement period, Kodak sold about four million cameras this way. As early as 1981, however, Kodak executives began to have concerns over premium camera sales. First, the cameras had to be extremely low-priced. In addition, market [*76] research showed that premium camera owners did not use as much film as those owners who purchased their own cameras or even compared to those who received a Kodak instant camera as a gift. Because of these problems, in 1984, Ms. Katherine Hudson, the head of Kodak's instant program, decided that Kodak should discontinue premium sales.

From 1974 to 1982, Polaroid only sold a few cameras in the premium channel. Polaroid executives testified that they did not like selling cameras this way because of the low price and low film-use rate. Mr. Booth specifically excluded premium camera sales in his assessment of what sales Polaroid could have made in the absence of Kodak. (TR 2624). Dr. Young testified that he was not enthusiastic about this channel. (TR 1145). Polaroid devoted minimal sales staff to this market consistent with these views.

In 1983, however, partly as a result of research which led Polaroid to believe that the premium camera business might be profitable, the company stepped up its participation in this channel. In the United States, premium sales went from 58,600 in 1982 to 629,500 in 1985. Even so, upon reflection at trial, Mr. Booth stated that "it was not the type of [*77] market place that is

worth the energy and effort to go after in great number." (TR 2294).

I find that in a world without Kodak, Polaroid would not have made all the sales that Kodak made through this channel, especially in the years 1977-1982. Polaroid would have made some of the sales, because it did use this channel, but the testimony of Polaroid executives convinces me that the company would never have participated fully. Therefore, for the years 1977-1982, I find that Polaroid would have made ten percent of Kodak's premium sales. Beginning in 1983, I find that Polaroid would have increased its participation, as it did histori-

cally, and would have made fifty percent of Kodak's sales. After 1983, Polaroid was fully active in this channel and I believe it could have made all of Kodak's premium sales.

Conclusion

For the most part, Polaroid's marketing capability was adequate to meet the demand for instant products but for Kodak's infringement. Polaroid would have been unable to make Kodak's sales in the premium channel, the Middle East, Latin America, and South Africa, as follows:

Premium Sales Lost (90%, 50%, 0%)	2,910,150	
Middle East Sales Lost (90%)	1,085,642	
Latin American Sales Lost (70%)	1,490,609	
South African Sales Lost (100%)	587,667	
Total Camera Sales Lost		
Due to Marketing	6,074,069	(rounded off)

[*78]

The resulting loss in film sales is discussed in Section VI.

(c) Effect of Two Competitors Advertising and Promoting Instant Products

Except in certain foreign markets, Kodak does not claim that its advertising and promotion was unique or better than Polaroid's. There is no dispute that Polaroid spent more on advertising than Kodak in every year of the infringement period and outspent Kodak two-to-one over the entire period. Moreover, Polaroid agrees that it would have had to spend even more on advertising to make additional sales. Polaroid included this cost in its lost profits calculation. In contrast, Kodak claims that even if Polaroid spent as much as the two companies combined it could not have duplicated the impact of two competitors' advertising. Kodak claims Polaroid alone would have been unable to generate the free media attention, dealer shelf space, and in-store display that Polaroid and Kodak jointly achieved for instant photography.

Professor Buzzell testified that when a competitor like Kodak enters a mass market like this one, a lot of "hype" is generated. News media report the story. Dealers stock both brands and may display them side by side.

Consumers [*79] become engaged in the comparison and pay more attention to the market. Even some Polaroid executives believed that Kodak's advertising in the first few years of its entry expanded demand for instant products. Mr. Wensberg testified that:

It is my belief that [the dual impetus of the heavier Polaroid advertising and the advertising which Kodak did] expanded [the market] temporarily, yes, and it is my belief that that was a short-term gain which was largely negated by other forces that were taking place in the marketplace.

(TR 993). Mr. McLaughlin, Mr. Brewer, and Mr. Voekel, who worked with Polaroid subsidiaries in Europe, made similar statements. (DF 60,528; DF 60,620; DF 60,532). Even Professor Dolan thought "that advertising spending and the publicity surrounding the entry of Kodak into the market, it [sic] had some impact on people's awareness of the instant photography category." (TR 4293). Of course, Professor Dolan also testified that additional Polaroid advertising could compensate for this effect.

Alone in the market, Polaroid could not have commanded the shelf space, point-of-purchase promotion, and amount of in-store demonstration that Polaroid and Kodak [*80] together achieved. This is true even if Po-

laroid had paid for additional trade support. Two Polaroid television commercials in a given evening would not engage the attention of consumers in the same manner as one Kodak and one Polaroid commercial. A synergy is created when a competitor enters a mass media market and the whole is soon greater than the sum of its parts. I find that the instant photography market was subject to this phenomenon.

Still, it is impossible to gauge the magnitude of the two-competitor effect. Professor Dolan testified that according to contemporaneous market research which assessed the impact of advertising, neither consumers' brand awareness nor purchase intention increased as a result of Kodak's entry. However, these studies focused only on Kodak and Polaroid instead of assessing whether awareness or purchase intention for the category as a whole had increased. Awareness of instant photography was nearly 100% even before Kodak entered, so it is not surprising that it did not increase. The purchase intention studies answered the question, "If you were to buy an instant camera today what brand would you buy?" The more helpful question is, "How likely is it [*81] that you will purchase an instant camera soon?" In addition, Professor Buzzell challenged the relevance of Professor Dolan's conclusions regarding purchase intention, finding that, according to Professor Dolan's evidence, it had actually decreased between 1974 and 1978. There was a small increase in purchase intention in the true sense in France and Italy between May and September 1977. (PT 2532). However, no witness analyzed the significance of this change.

I have examined other evidence that helps me quantify this effect. In response to my question, Professor Baumol agreed that his market expansion variable may have partially captured this effect when he calculated that the market expanded seventy percent with Kodak's entry. Because Professor Baumol did not find market expansion after 1981, it coincides well with Kodak's decision to sharply reduce promotion efforts around 1981. Even if I found that measure reliable, it would not tell me what portion resulted from the dual-advertising phenomenon. Kodak proffered many other reasons for the expansion which I have rejected. Professor Dolan opined that the portion of historical sales which he could not attribute to lower prices were [*82] probably attributable to advertising, but he concluded that Polaroid could make up that difference by spending more advertising dollars. Professor Fisher concluded that advertising levels had no effect at all on the demand for instant cameras, a conclusion which I cannot accept.

Conclusion

Having no firm basis upon which to judge what portion of sales Polaroid would not have made absent the

dual-advertising phenomenon, I must let the burden of uncertainty fall upon the infringer. Neither party has given me a reasonable analytical tool for sorting out this effect. The consumer's purchase process is immensely complicated and it, may be impossible to identify individual motives except in a very general way.¹³ Therefore, I conclude that Polaroid's profits should not be reduced to account for the dual advertising effect.

13 One possibility would be to survey Kodak purchasers during this time period and ask what their motivations were in purchasing their camera. See, e.g., Bio-Rad Laboratories, Inc., v. Nicolet Instrument Corp., 739 F.2d 604, 616 (Fed. Cir.), cert. denied, 469 U.S. 1038 (1984); Skenyon and Porcelli, Patent Damages, 70 J. Pat. Off. Soc'y 762, 782 (1988). Of course, there would be problems with this data; consumers might not remember, may be unable to recognize how they were influenced, or may be biased from subsequent events. Kodak attempts to support its claim that a significant number of Kodak purchasers would not have bought Polaroid by offering a survey done at the time Kodak was ordered from the market. The survey asked Kodak purchasers whether they would like to receive a Polaroid camera or a conventional Kodak camera in place of their Kodak instant camera. (DF 21,579). Many preferred to receive a conventional camera.

The survey did not ask the respondents whether, without Kodak, they would have forgone the purchase of instant at the time they bought it; the survey asked what type of camera customers would like at that moment, after however many years of instant camera ownership and given all the changes in the photographic market. The results, therefore, do not support Kodak's claim.

[*83] Kodak also claims that in some of its foreign subsidiary markets, its advertising strategies were more in tune and targeted at the particular culture and thereby created interest in instant photography. Polaroid's advertising was not as effective, Kodak argues, because it employed, essentially the same basic themes used in the United States and was not tailored to foreign markets. I find nothing in the record to suggest empirically which approach was best, and I do not find that Kodak's advertising in these markets induced sales that Polaroid's advertising could not have produced.

(d) The Evidence of Market Expansion

After considering the means by which Kodak claims it expanded the market and having arrived at the conclusion, with a few exceptions, that Kodak did not influence

the market in a way that Polaroid could not duplicate, I turn now to examine Kodak's empirical evidence that the market did, indeed, expand by its entry.

Kodak offers three types of information to show that the market expanded: (1) contemporaneous research that Polaroid and Kodak purchasers were drawn from different groups; (2) contemporaneous predictions and conclusions about market expansion by Polaroid [*84] executives and outside financial analysts; and (3) Professor Baumol's econometric model which, by estimating the influence of various factors on the demand for instant cameras, concluded that Kodak expanded the market so substantially that Polaroid would have captured none of Kodak's sales from 1976 to 1978, a small percentage in the middle years, and all of Kodak's sales in the last three years.

The contemporaneous statements that Kodak offers do not compel me to conclude that the market expanded. First, the contemporaneous predictions by Polaroid personnel were largely fueled by the belief that Kodak would be bringing a unique product to the market. In some cases, statements were made in order to quell fears that Kodak's entry might have a devastating impact on Polaroid. In addition, the statements were merely guesses about the future. Second, the concurrent statements of Polaroid executives and conclusions of analysts that the market had expanded are not as reliable as my hindsight review of the facts. Moreover, some speakers had different concepts of market expansion; some statements imply that the speaker considered additional Kodak advertising -- not just the synergistic effect [*85] -- as a market expanding mechanism.

Kodak also presented the results of research it claimed tends to show that Polaroid and Kodak drew their customers from "somewhat different groups." (TR 11152). One study, conducted between April 1976 and January 1978, surveyed 25,000 registered owners of Kodak instant cameras and reported that seventy percent of these purchasers had never owned an instant camera before. (DF 61,574). A 1979 survey of an unspecified number of new Polaroid purchasers found that only thirty-five percent had never owned a Polaroid camera before. (DF 20,097). From this, Kodak concludes that it drew an untapped pool of new purchasers into the market that Polaroid could not have exploited. I find otherwise. These two studies are not comparable, as they were conducted at different times and with apparently different sample sizes and types. They catch only a small snapshot of time. They do not specify, nor does Kodak offer, any explanation for the phenomenon it claims they expose. Standing alone, they cannot establish market expansion.

Professor Baumol's models showing market expansion are also problematic. Using multiple regression

analysis, Professor Baumol attempted [*86] to ferret out Kodak's influence on the market by estimating the relationship between certain key variables and the demand for instant cameras. He introduced a variable to account for Kodak's presence and found that it demonstrated a significant effect on the market. These models are quite complicated and so I will start by explaining, as simply as I can, how the models work.¹⁴

14 I am only attempting to explain the operation of those parts of the model which bear directly on my analysis. For an expert guide to the Kodak models, see *Two Kodak Camera Demand Models: A Guide for Non-Specialists*, by Professor Baumol. (DF 61,605). For a more general explanation of multiple regression, see Fisher, *Multiple Regression in Legal Proceedings*, 80 Colum. L. Rev. 702 (1980). (PT 2539).

Professor Baumol reviewed the facts of this case and made various assumptions about what forces were operating in the instant camera marketplace. Although in the beginning he identified more variables, in the end he [*87] chose five: (1) integral camera prices;¹⁵ (2) the per print price ratio of integral and conventional film; (3) 35mm wholesale camera prices; (4) dollars spent on total integral advertising; and (5) Kodak market expansion. For each variable except market expansion, the model calculated the effect on camera sales of an increase or a decrease in the independent variable. By taking into account all four relationships at once, the model generated the relative influence of each variable as it operated historically. This is the basic technique of econometrics.

15 In his "feature adjusted" variant model, Professor Baumol adjusted the price variable to take into account feature differences.

In his standard demand model, Kodak Model I, Professor Baumol introduced a "dummy variable" to capture the effect of Kodak's market entry. Instead of using a value, such as the price of 35mm cameras, he inserted a "0" for those years when Kodak was absent and a "1" when it was present. The model then answers the question: what possible [*88] relationship or correlation exists between this difference and the demand for cameras that best fits the facts? If that correlation is strong the difference is significant. Professor Baumol found a significant relationship between Kodak's presence in the market and camera demand in the first six years of the infringement period. In the later years, the coefficient was not statistically significant; any influence on demand as a result of the difference was just as likely due to chance as to Kodak's presence.

Professor Baumol freely admits that any model is colored by the assumptions upon which it is based and

by the influences the model builder chooses to include or to omit. Although Professor Baumol chose to include market expansion, I have found, with a few exceptions, that there was no market mechanism unique to Kodak which the facts show could have expanded the market. Although I cannot paint a perfect picture of the market from the testimony of fact witnesses, contemporaneous documents, and market research, I find that evidence much more reliable than even the best econometric model. The direct evidence is, after all, the factual basis of the case, not some approximation built [*89] on facts. Besides being contrary to the facts, the extreme results of Professor Baumol's model -- that Polaroid would have captured none of Kodak's sales between 1976-1978 and only a small percentage from 1979-1983 -- add to my conviction that it is unreliable. I, therefore, reject its conclusions as contrary to other evidence which I find more credible.¹⁶ Even Professor Baumol's final and conservative conclusion that Polaroid could only have captured twenty-five percent of Kodak's sales is far removed from my view of the facts. Still, because I respect Professor Baumol's expertise and he did include the dummy variable for market expansion and find it significant, I will attempt to explain why he might have found this effect.

16 For the same reasons, I also reject Kodak's "nested logit" model. This alternative model attempted to measure the attractiveness of individual camera models, of the two instant brands and of the entire instant category. The model concluded that Polaroid could only capture 24.3% of Kodak's sales over the period of infringement. Professor Baumol used the nested logit as a check on the reasonableness of his standard model. To an even greater degree than the standard demand model, the nested logit model runs contrary to my findings about the crucial influences on the demand for instant photography. Its result is equally extreme and therefore rejectable.

[*90] First, both Professor Baumol and Professor Fisher agreed that market expansion cannot be measured econometrically if all one considers is the demand for low- and medium-range cameras. (TR 11193; TR 5103-4). There are not enough years when low- and medium-priced cameras were available and Kodak was not in the market to make the comparison reliable. So, in order to measure market expansion, Professor Baumol included high-priced instant cameras. He was thereby able to include the years 1973-1976 as "0" years and make the statistic reliable. The model therefore compares demand in two different eras: when low- and medium-range cameras were not in the market and when they were available. Supposedly, the market expansion variable will not capture any change in demand due to price, because the price variable will measure that effect. I believe, how-

ever, the dummy variable could be capturing something else entirely: a change in the marketplace that is not easily quantifiable -- instant photography's metamorphosis from a sophisticated picture-taking technique for the wealthier buyer or the photography buff to a fun system accessible to everyone. When Polaroid and Kodak offered low- and medium-priced [*91] cameras, they did more than lower prices; they made cameras available to more people thereby changing the image of the entire field. Call it a fad. Call it the development of a mass market. For reasons not having to do only with Kodak, the market changed. Since it changed at the same time Kodak entered, the market expansion variable may be capturing this sensation.

While I do not accept these models in this case, I am not critical of the field of econometrics as a whole. I believe it can provide valuable insight into complicated matters. However, in this case the models contain assumptions contrary to the facts and achieve extreme results which by their very nature are suspect. Perhaps the inner workings of the models, which I cannot fully comprehend, are biased. Perhaps the instant photography market does not lend itself to mathematical interpretation. Whatever the reason, I cannot adopt Professor Baumol's model as evidence of market expansion.

Conclusion

But for Kodak's infringement, Polaroid had the marketing capability to make most of Kodak's sales. I find that while Polaroid was not capable of making all Kodak's sales in the premium channel and in some foreign markets, [*92] there was nothing unique and critical to Kodak's entry such that without its infringement, demand would have been diminished.

2. The Market of the Future, According to Polaroid

Having considered Kodak's claim that the market would shrink without them, I now turn to Polaroid's claim that without Kodak the market would have been more profitable and would have extended far into the future. Polaroid's case is based, in the first part, on its assertions that Kodak's behavior in the market forced the company to lower prices and that without Kodak, it would have charged considerably more for their cameras and film. Polaroid also claims it would have introduced the Onestep camera one and one-half to two years later, allowing them to capitalize on Pronto! sales, produce a better Onestep and avoid the boom (and therefore, the fall) of instant sales. Polaroid uses the econometric model of Professor Fisher to show how its alternative strategy would have generated demand for cameras and film which would result in profits of over \$ 3.9 billion. In Section (a), I examine Polaroid's historical pricing behavior and in Section (b), I discuss generally the rela-

tionship between higher prices and [*93] demand in this market. Section (b) also includes a discussion of Professor Fisher's model.

(a) Polaroid's Historical Pricing Behavior

The key to Polaroid's alternative damage scenario is the proposition that Kodak caused Polaroid to lower its prices and its corollary, that higher prices would have meant more profit. To some degree, whether Kodak caused Polaroid to charge less for cameras is irrelevant if I conclude that the higher prices Polaroid proposes would not have been more profitable. Still, since I find that Polaroid lowered its prices consistent with their past behavior as a monopolist and in response to the market, irrespective of Kodak's influence, the first proposition sheds light on the second.

The record contains a great deal of evidence from which one can infer that Polaroid, even without Kodak in the market, would have lowered prices and introduced the OneStep as it did during the infringement period. Although Polaroid may not have lowered prices as far or as fast as they did historically, it is important to note that the general pattern was not new to Polaroid. Polaroid was aware of the price points in the industry; it knew that the majority of camera sales [*94] were made with cameras priced under \$ 50. In the pack era, Polaroid offered successively lower-priced models. It sold the swinger for \$ 20 in 1966. It sold the Colorpack II in 1969 for about \$ 30. It offered other cameras in this price range. (TR 227-28). Mr. McCune testified that Polaroid was aware that "there were parts of the public who would respond to low-price products that didn't respond to middle-price products." (TR 228).

Polaroid followed a pattern of quickly introducing lower-priced models with the folding SX-70. Although Polaroid did not achieve full distribution of the deluxe SX-70 until 1974, it introduced the lower-priced Model 2, with reduced margins, in that year. The Model 3 was introduced in 1975 at a \$ 13 loss. In an August 1974 memorandum to Polaroid top executives, Peter Wensberg justified introducing the Model 2 and 3 with "unacceptable margins" because it would increase camera volume as well as generate additional film sales. (DF 20,244). He testified that Polaroid believed it was not profitable to raise prices:

"But by increasing prices, we obviously felt we would not sell as many cameras; hence, not improve camera division variance; hence not achieve [*95] incremental film sales."

(TR 910). Polaroid knew the advantages derived from lowering prices and historically followed a pattern of doing so.

Polaroid took the first leap into mid-priced integral cameras with the Pronto!. The Pronto! was specifically introduced to have wider appeal among consumers. Although Dr. Land did not want to introduce the hard-bodied line, Mr. McCune, who became president in late 1974, advocated a mid-priced model. Pronto!'s introduction was not influenced by Kodak even though Polaroid had strong signals as early as 1970 that Kodak planned to enter the market. (TR. 344). Kodak reduced the initial price of the EK-4 and EK-6 models because of Pronto!'s low price.

Although Polaroid had no firm plans to introduce the Onestep in 1977, the elements of a low-priced model were being explored. This is the reason Polaroid was able to respond so quickly to the Handle. (TR 234-35; 341-42). Mr. Bassett, Polaroid's sales forecaster, recommended to Mr. Wensberg that Polaroid "introduce an under \$ 25.00 SX-70 type camera early in 1977." (DF 70,076B). Mr. Wensberg also advocated a product priced under \$ 50. (DF 20,279). Throughout the infringement period, whenever Polaroid [*96] introduced lower-priced models, Kodak executives felt they had to respond because the Polaroid cameras at comparable prices usually had more features. (TR 7816-30). Moreover, some price cuts Polaroid instituted were deceptive, as the cheaper product often offered fewer features. The 1978 Pronto RF price cut, for example, occurred after Polaroid removed the camera's tripod mount and timer.

Polaroid claims it was unable to raise its film price as high as it would have liked because of competition with Kodak. Yet, well before Kodak's entry, Polaroid knew that "the strongest reason consumers do not buy a Polaroid camera is due to our film price." (DF 61,606, Tab 9; see also Tab 11). Both companies priced their film almost identically throughout the infringement period. In only one instance was there was a nine month delay between when Polaroid raised its film prices and Kodak followed. Kodak also initiated several price hikes which Polaroid followed. Mr. Brewer stated:

From my personal perspective, we basically set our prices predicated upon what we felt would have impacted both our volume and margins; and the Kodak film price, to my recollection, they were normally quite responsive [*97] to whatever we did, in terms of if we increased our price, the sense was that Kodak increased their prices. So the sensitivity level in pricing was not very intense at all in the film area.

(DF 70,007A). Still, Polaroid claims it feared raising prices because of Kodak.

From about 1980 on, the foremost concern of Polaroid executives in pricing film was the competition with conventional photography, specifically, 35mm cameras and film. In 1981, Mr. Booth reported to Polaroid's board

that "[the] relative price of an instant picture to a conventional picture is a major concern" and that "if we raise our prices much more than five percent per year we will widen the ratio of instant to conventional and it is already very high." (DF 10,413 at 0838-39). In 1982, Polaroid's Director of Strategic Planning wrote a series of memoranda concluding that the widening gap between the price per print of instant and conventional photography "had a substantial negative effect on Polaroid's share of the amateur photographic market." (DF 61,606, Tab 6). Many other Polaroid reports, memoranda, and studies report the concern of the relative film prices between instant and conventional. (See, e.g., [*98] DF 61,606 Tab 22, Tab 27). This constraint on film pricing would have been present without Kodak and I believe Polaroid's response would have been the same.

Conclusion

After reviewing all the evidence in this regard, I find that even in Kodak's absence Polaroid would have lowered camera prices, introduced the lower-priced OneStep and felt constrained regarding film prices just as it did historically. Polaroid claims that it would not have lowered prices but the proof is to the contrary. The decline in instant film prices cannot be laid at Kodak's door. The market was changing, influenced both by the competition from conventional photography and changing consumer perception of instant photography. Perhaps Polaroid would not have lowered prices as quickly or significantly as they did. Unfortunately, Polaroid has not made such a modest and reasonable claim. Instead, it has presented scenarios which include large price increases on both cameras and film. This Court has neither the evidence nor the tools to generate a demand curve based on more modest and more realistic price increases.

(b) The Effect of Higher Prices in the Instant Photography Market

Although Polaroid was [*99] pricing its cameras and film independently of Kodak, that finding is not crucial because I also find that the higher prices Polaroid says it would have charged would have depressed demand so substantially that the strategy the company historically pursued is actually the more profitable one.

If Polaroid had raised its prices as high as it claims, demand would have been substantially diminished. Polaroid presented basically two alternative pricing strategies. The prices it originally planned to charge for cameras and film were generated by Professor Fisher and in one scenario ranged from fifteen percent to 113% over historical prices.¹⁷ (DF 61,541; Tr. 11667). In response to my question during his direct examination, Mr. Booth testified on re-direct that Polaroid would have charged \$ 10 more for each camera, but for Kodak. Mr. Booth also

testified that film prices would have risen at ninety percent of the Consumer Price Index in normal years and eighty percent in years of hyper-inflation. Historically, Polaroid priced its film at about fifty percent of the Consumer Price Index. (PT 2303; TR 2462-64).

17 Professor Fisher claimed that he arrived at these prices by "fiddling. We took some price. We asked whether they produced -- we looked at the results they produced. We asked whether they seemed sensible in terms of what Polaroid executives had to say; and when they seemed sensible, as I said before, we stopped." (TR 5187). In other words, Professor Fisher manipulated hypothetical prices rather than simply taking the opinion of some Polaroid officer and feeding it into the model. In addition to this questionable methodology and the astonishingly high prices, Professor Christiansen points out that the pricing pattern is also bizarre, with prices going up and down and up again. These patterns are inconsistent with Polaroid's pricing behavior in the real world before and after Kodak.

[*100] Despite these higher prices, both Professor Fisher and Mr. Booth conclude that Polaroid would have been able to sell substantially more cameras. Mr. Booth predicted that from 1976 to date, Polaroid could have sold all the cameras it historically sold and seventeen to twenty million more. Even with the higher prices on film, he believes the company could have sold 300 to 350 million additional packs of film. Professor Fisher concludes that from 1976 to 1990, Polaroid could have sold essentially all the cameras that it sold historically and those that Kodak sold, all at his higher prices. I reject both of these conclusions because they contradict the overwhelming evidence of extreme price sensitivity in this market. Professor Fisher's conclusions also conflict with the substantial evidence that film and camera prices were seriously constrained after 1980 by the increase in the relative value of conventional photography.

As I discussed in Section (a), Polaroid was well aware that raising prices would diminish demand. Numerous Polaroid documents, including market research studies, establish that demand was very sensitive to price, especially to the price of film. (For a list of [*101] some relevant excerpts in this regard, see DF 61,606). Since Kodak left the market and Polaroid has raised its camera and film prices, sales have dropped significantly. (DF 61,025; DF 61,034; TR 8169-71). Professor Dolan underscored this price sensitivity in his analysis of what affects demand. He demonstrated how one could explain almost all of the boom and fall of instant photography simply by tracing price changes. (TR 4253-81). Professor Baumol also concluded that higher film prices would

have a drastic effect on demand. One of his scenarios showed that if Polaroid raised its prices as little as ten percent, revenues on cameras and film would decrease by ninety-one percent. (DF 61,622).

Higher prices and diminished demand can result in higher profits. An increase in profit per camera can outweigh the smaller profit realized from a larger number of sales. But this fact holds true only to a certain level, for if demand falls significantly, profits will also fall. In light of the all the evidence on this point and given the high prices Polaroid used in its demand scenario, I find that it would have generated less profit pursuing the higher pricing strategy than the strategy it pursued [*102] historically.

Polaroid's ability to charge higher prices was and would be seriously constrained after 1980 by competition with conventional photography, chiefly the 35mm camera system. In the late 1970s, 35mm cameras commanded an increasingly larger market share. In the period 1979-1982, average annual sales of 35mm cameras totalled about four and a half million units, up from about a million units annually in the period 1976-1978. By 1979, 35mm camera sales accounted for sixty-four percent of all camera dollars spent by consumers. (DF 61,742, Tab 1). Other conventional photography products also competed with instant, but not to the same degree. (TR 2556; DF 60,1744).

Consumers were attracted to 35mm photography because of the high quality that an amateur photographer could achieve. When 35mm manufacturers began to add features such as autofocus, auto-exposure, auto-load and auto-advance, the chance of consumer error decreased. Increasingly, the kind of photographs consumers took with these cameras became the standard of what constituted a good, acceptable quality print." In this way, they began to compete with instant even before the prices became more directly comparable. In [*103] internal reports during this time period, Polaroid recognized that 35mm had become the new industry standard. (E.g., PT 2293; see also TR 1660).

The price of 35mm cameras declined on the order of thirty to forty percent in the early 1980s. Average customs values on 35mm single lens reflex ("SLR") cameras declined by thirty-six percent from 1976-1985. As advertised in the New York Times, the price of the Canon Sure Shot, an immensely popular non-SLR camera, declined from \$ 144 in 1980 to \$ 103 in 1983, or twenty-eight percent. In 1983, non-SLR cameras were offered for as low as \$ 70. Although these cameras were still above the lowest-priced instant cameras, their relative value placed them directly in competition. In 1983, Polaroid asserted:

The decline in the demand for the instant category as a whole, rather than for Polaroid in particular, points toward conventional cameras, especially 35mm cameras, as Polaroid's main competition rather than Kodak instant.

(DF 61,742, Tab 5). Other Polaroid documents show that in the minds of Polaroid executives, the difference in quality between conventional and instant prints was a major factor in the declining demand for instant. [*104] (E.g., DF 61,742, Tab 2; DF 21,054). Mr. Booth testified that he believed that from 1980 onwards 35mm quality and convenience surpassed the quality and convenience of instant prints, while the price for instant prints were higher. (TR 2538-39).

The cost per print of instant became more expensive relative to conventional during this period. In 1981, Mr. Booth reported that the ratio was an "already high" two-to-one. The ratio increased partly because the cost of conventional photofinishing was declining. First, color paper costs were dropping. Second, with the proliferation of photo-developing kiosks in the 1970s and minilabs in the early 1980s, competition between photofinishers was keen and drove the price down. Polaroid executives were concerned about this ratio and knew it affected the purchase of both cameras and film. (E.g., PT 2293; DF 60,174).

Developments in 35mm photofinishing contributed to the declining demand of instant and reduced Polaroid's ability to raise prices in any "but for" world. First, it became more convenient. The number of minilabs grew from 1000 in 1980 to 14,000 in 1988; it was easier for consumers to find a film developer. Second, the time to [*105] develop pictures went from a week, to three days, to twenty-four hours and finally, to an hour. Consumers could now get high quality prints in a very short time, cutting into instant's traditional domain. Photofinishers were often camera retailers, too, and there was also some evidence that they were more likely to stock and sell conventional cameras.

I find that Polaroid would not have been able to raise its prices significantly without greatly reducing demand. Not surprisingly, Professor Fisher reached a different conclusion. have considered his analysis in my review of the record and I reject it as being unreliable and contrary to the bulk of evidence in this case. I do not have the skill or the obligation to parse his model to show why we come to different conclusions. Professor Christiansen, an econometrician who testified for Kodak, dissected the intricacies of Professor Fisher's model and exposed its unstated assumptions, biases and errors. ¹⁸ Below, I will attempt to explain in a broad, non-technical sense why I find his model unreliable.

18 In particular, I found persuasive Professor Christiansen's testimony on the following aspects of Fisher's model: incomplete foreign data; the lack of a model for the "rest of the world"; the use of the 35mm stock variable; the inelastic nature of the film burn equation; the substantial variation in the film burn rate depending on the country; the use of the same film burn rate in the years three through eight; the separate treatment throughout the model of low- and mid-range cameras; the odd purchase pattern resulting from the search rate; the substantial variation in the percent of probable buyers, the search rate results and the re-purchase rate across countries; the large number of consumers who are assumed to value the instant photography system at the same price and the inflexible nature of those valuations; the results of the use of the Sun technology dummy variables across countries; the odd pricing patterns; and the manner in which later introduction dates and price effects shift demand into the future.

[*106] Professor Fisher constructed a model reflecting his judgments about what influences the demand for instant cameras and film. His work includes two models: a "film burn" model which estimates the number of film packs that a camera owner will use over the life of a camera, and a camera demand model which calculates the number of cameras that consumers would have purchased given a certain set of camera and film prices and introduction dates. Professor Fisher arrived at his model just as Professor Baumol did: by making assumptions about the influences on demand, entering the historical values of those influences and arriving at a mathematical relationship between the influences and the number of cameras that were purchased. Professor Fisher then took one further step and used this framework of relationships to predict the future. By changing the price and the introduction dates, he claimed that he could show how demand would have been affected by Polaroid's alternative strategies. Professor Fisher concluded that by pricing its cameras and film higher and delaying the introduction of the OneStep, Polaroid would have been able to make between \$ 3.1 and \$ 3.5 billion in additional sales [*107] of cameras and film.¹⁹

19 Professor Fisher finally adopted Mr. Booth's price and introduction strategies because Mr. Booth was "in the business" and his strategy, massaged by Professor Fisher in his model, generated a profit value in the middle of the range the professor had calculated with his own scenarios.

In Professor Fisher's model, Polaroid charges more in the Kodak-free world, and yet sells the same number of cameras from 1976 to 1990 that Polaroid and Kodak sold together from 1976 to 1985. The model achieves this result because price is the only factor which ultimately influences demand. The model assumes that consumers have in mind a price which they will pay for an instant camera system. The price includes both the camera and the number of film packs the consumer is estimated to use from Professor Fisher's film burn model.²⁰ The consumer compares her "reservation" price to the system price and if it is the same or less, she becomes, in model parlance a "probable buyer." Once a probable buyer, [*108] only the "search rate" ultimately influences when the consumer will purchase a camera. The search rate assumes that in each year only twenty-one percent of the probable buyers will purchase. The search results in a mean waiting time of 4.5 years before purchase.²¹ In this manner, Professor Fisher's model pushes off demand into the future; regardless of the different prices and dates used, the typical pattern of results is lower sales in the beginning years and higher sales thereafter.

20 This proposition in itself contradicts how consumers act in the real world because most instant cameras are bought as gifts. Presumably the buyer, who gave the camera as a gift, will not pay for the film, and therefore the price of film over the life of the camera does not have a significant effect on the purchase decision. Yet, film price is a major portion of the system price. Professor Baumol attempted and rejected a similar system price model for this reason.

21 Again, this essential part of Professor Fisher's model is in direct conflict with other evidence derived from market studies. Professor Baumol testified that having decided to purchase an instant camera, consumers take a relatively short time, weeks or months, to act on that decision. (TR 11311-12).

[*109] In this way, Polaroid is able to have its cake and eat it, too; it can exploit those who would pay more and capture the rest later. This is really just a version of the "skim pricing" which monopolists often employ. The market would not have worked in the way Professor Fisher envisions, however, because consumers' willingness to pay for instant photography was changing. The market was heavily influenced by the relative value of conventional photography. Professor Fisher's model does not adequately account for that variable.

Professor Fisher's attempts to capture the effect of competition from conventional photography are minimal

and misguided. His model includes a variable reflecting the number of 35mm, instamatic, and disc cameras purchased. Not only is this contrary to the way in which Polaroid documents routinely discuss the effect of conventional photography, Professor Christiansen points out that measuring competition by stock rather than price is wrong and leads to error. (TR 11549-50). Not surprisingly, Professor Fisher found no effect from conventional photography on the sales of low-priced instant cameras. As a result, none of his pricing scenarios captures any competition [*110] at this level. This conclusion contradicts the views of Polaroid executives who reported that conventional photography products competed with instant products at all price ranges.

Professor Fisher's model does not account at all for the competition between the relative price per print between instant conventional pictures. As I have already found, Polaroid believed conventional film with processing competed directly with instant film. Professor Fisher's own consulting group, Charles River Associates, determined that seventy-seven percent of Polaroid households also owned a conventional camera and that consumers can and do choose between whether to use conventional or instant film. (TR 11290). In his scenarios, Professor Fisher assumed that conventional film prices constrained Polaroid's ability to raise its own prices, yet the scenarios do not consider that constraint until 1985, considerably later than the evidence shows it was significant to consumers and to Polaroid officials.

By not capturing the profound effect of the competition from conventional products, Professor Fisher overestimated the prices Polaroid could have charged for instant products. He also overestimated how much [*111] consumers valued the technological changes of the Sun system. In his model, consumers were assumed to change their valuation of instant photography and therefore be willing to pay more for an instant system after the Sun introduction; this allows Polaroid to raise its prices even higher without losing sales. Yet, the record shows that consumers did not view the Sun system as new technology. Sales were poor and there was no evidence of market expansion. Eventually, Polaroid lowered its prices on this line in order to stimulate sales.

Other elements in Professor Fisher's model run counter to the evidence. Professor Fisher found no effect on demand from advertising -- contrary to the opinion of almost every other witness who testified about the market. Professor Fisher found that the price of film did not affect the number of packs that an owner would use over the cameras lifetime -- contrary to the opinion of almost every other witness who testified about the market. The packs per camera total included in the system price in Professor Fisher's model is not susceptible to changes in film price -- contrary to the opinion of almost every other

witness who testified about the market. Professor [*112] Fisher had incomplete data for markets outside the United States and yet felt confident to model the sales in those countries. These factors and others lead me to find Professor Fisher's model unreliable in predicting demand.

The profits which Professor Fisher believes Polaroid would have realized without Kodak are so high, given the fact that both Polaroid and Kodak lost money in the real world, that they cast doubt on the credibility of his analysis. Professor Fisher supported his results by pointing out that his calculations generate profits as a percentage of sales that are consistent with Polaroid's experience in the pack era. Irrespective of Kodak's entry, however, there are so many differences between the market in the 1950s and 1960s and the market from 1976 to 1985 that I do not find this comparison helpful. In the 1970s, Polaroid began manufacturing almost all of its own components. In the 1970s, conventional photography rose in value to compete with instant. Professor Fisher has not acknowledged these changes.

Mr. Booth also believed that higher prices would not significantly affect the total demand. For some of the same reasons that I reject Professor Fisher's conclusions, [*113] I also reject Mr. Booth's. Chiefly, the demand at those prices is too high given the price sensitivity of demand in the instant photography market. However, I am limited in my analysis of Mr. Booth's opinion because he did not explain his methodology or assumptions. Of course, in the process of considering Professor Fisher's model I have encountered the "essence" of Mr. Booth's numbers, but the flaws of that analysis belong to Professor Fisher and not to Mr. Booth.

Conclusion

It would be ridiculous to conclude that Kodak's presence in the market did not influence how Polaroid conducted its instant business from 1976 to 1985. Other than losing the sales that Kodak made, however, Polaroid has not proven additional damage. It has not shown that it would have charged higher prices. It has not proven that it would have introduced the OneStep later. Even if I were to conclude that Polaroid would have waited to introduce the OneStep, it has failed to prove what would have resulted. Polaroid failed to prove, even in a rough way, what those consumers who historically purchased OneSteps and Handles would have done in a world without Kodak. Even giving Polaroid every benefit of the doubt, [*114] the Court is unable to conclude that the company would have reaped greater profits. Liability does not extend to speculative damages. [Yarway, 775 F.2d at 275](#); [Bio-Rad, 739 F.2d at 616](#).

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Polaroid has failed to prove that higher prices would have brought it greater profit or that Kodak caused price erosion. As a result, Polaroid has not proved that its damages extended beyond 1985; in its proposed scenario, the high prices and delayed introductions would have increased demand from 1985 to 1990. Polaroid's prices after 1985 were not affected by Kodak's infringement. Polaroid is only entitled to lost profits from the sales Kodak made minus those sales Polaroid would have been unable to make because of limits in its marketing capability.

IV. Polaroid's Manufacturing Capacity

Legal Principles

Factual Findings & Conclusions

A. Film Manufacturing

Introduction

1. Polaroid's In-Place Capacity: Film

a. In-Place Capacity of Assembly Machines

No Coverage

No Material Time

Engineering Updates

Conversion to Other Products

b. In-Place Capacity of Components

Positive Sheet

Negative Base

New Bedford Negative Coating

Batteries

[*115] 2. Polaroid's Potential Capability

a. Film Assembly Machines

1977-1978 Time Required to Bring Into Production

Machine Starting Dates

1979-1980

1981-1985

Conclusion

B. Camera Manufacturing

Introduction

1. Polaroid's In-Place Capacity

1976

1977-1980

1981-1985

Legal Principles

To recover profits on lost sales, in addition to marketing capacity, Polaroid must also show that it had the ability to manufacture sufficient cameras and film to meet Kodak's sales volume. [State Indus., 883 F.2d at 1577](#); [Datascope Corp., 879 F.2d at 825](#); [Water Technologies Corp., 850 F.2d at 672](#). This showing is an integral part of proving that Polaroid is entitled to lost profits; if Polaroid could not manufacture the product to meet demand, it cannot prove that it would have made the sales in the "but for" world.

While Polaroid is not required to show it had empty factories waiting for additional work, see [Livesay Window Co., 251 F.2d at 473](#), it must prove, by a preponderance of the evidence, that it [*116] had at least the potential capability to meet the demand. [Bio-Rad Laboratories, Inc. v. Nicolet Instrument Corp., 739 F.2d 604, 616 \(Fed. Cir.\), cert. denied, 469 U.S. 1038 \(1984\)](#). Accord [State Indus., Inc. v. Mor-Flo Indus., Inc., 8 U.S.P.Q.2d 1971, 1979 \(E.D. Tenn. 1988\)](#), [aff'd in part and vacated in part, 883 F.2d 1573 \(Fed. Cir. 1989\)](#); [Kori Corp. v. Wilco Marsh Buggies & Draglines Inc., 561 F. Supp. 512, 527 \(D. La. 1981\)](#), [aff'd, 708 F.2d 151 \(5th Cir. 1983\)](#), transferred to [761 F.2d 649 \(Fed. Cir.\)](#), cert. denied, [474 U.S. 902 \(1985\)](#); [W.L. Gore & Assoc., Inc. v. Carlisle Corp., 198 U.S.P.Q. 353, 362 \(D. Del. 1978\)](#). Although both Polaroid and Kodak agree that the law does not require Polaroid to have in place the ability to make the combined volume, they disagree about what kind of showing will satisfy Polaroid's burden of proving that it had the potential to meet the demand. This may be a simple dispute about whether Polaroid has met its burden or it may be a genuine dispute about the standard to be [*117] applied. In either case, the issue deserves some preliminary discussion.

The seed of this dispute is that Polaroid's in-place manufacturing capacity was not sufficient to satisfy the combined demand which came fast and furious in the first three years of the infringement. Polaroid has not convinced me that the opportunity to make Kodak's sales existed at any other time than when Kodak historically made the sales. (See Part II). Therefore, Polaroid must necessarily present an expansion scenario which shows what steps, including some time-consuming capital investment, it conceivably could have taken to meet the demand.

One interpretation of Polaroid's proffer on this issue is that Polaroid believes that if the patentee can put for-

ward any possible expansion scenario that meets the production requirements, regardless of how unlikely or unreasonable it may be, it has met its burden.²¹ In other words, Polaroid may be urging that if it theoretically could have taken steps to produce the combined volume, it has proven it could have made the sales. During trial, Kodak commonly referred to this approach as the could have standard. Kodak claims that what Polaroid could have done [*118] is irrelevant; Polaroid must show, by a preponderance of the evidence, what it would have done. Kodak argues that Polaroid must show exactly why, when, and how it would have increased capacity. Kodak argues that the record shows a disparity between what Polaroid would have and could have done, given Polaroid's history of inaccurate forecasting, conservative decisionmaking, and other quirks of its corporate personality.

21 It has been very difficult to reconcile Polaroid's argument and proof on this issue. It argues that it must prove capability yet its proofs go almost exclusively to show what it theoretically could have done with little evidence as to what it reasonably could or would have done. This evidence is examined more closely under the sections entitled "Could v. Would Revisited" in the both the film and camera manufacturing findings. For purposes of this discussion, I am assuming Polaroid is urging the theoretical "could have" standard. It may, in fact, be urging the proper standard.

Neither claim [*119] is quite right. The case law does not define potential capability very clearly. To be sure, patent owners have not been held to the type of absolute proofs Kodak desires. See, e.g., [King Instrument Corp. v. Otari Corp.](#), 767 F.2d 853, 864 (Fed. Cir. 1985), cert. denied, 475 U.S. 1016 (1986) (lost profits awarded where the patentee did not manufacture a product equivalent to the infringing product at all during the infringement period). The cases make it clear that the patentee's proof on all issues is that of a reasonable probability. E.g., [Aro Mfg. Co. v. Convertible Toe Replacement Co.](#), 377 U.S. 476, 507 (1964); [A. Stucki Co. v. Worthington Indus., Inc.](#), 849 F.2d 593, 597-98 (Fed. Cir. 1988); [Yarway Corp.](#), 775 F.2d at 275. Polaroid's standard, if that is in fact what it is urging, renders the manufacturing capability requirement meaningless. Any patentee can concoct a scenario to achieve the necessary result.

In reality, the legal standard has substance and meaning. Courts have refused to award lost profits when, for example, the use of an alternative facility to meet demand would [*120] have required the patent owner to curtail production of another more profitable product. [Deere & Co. v. International Harvester Co.](#), 218

[U.S.P.Q. 403, 407 \(C.D. Ill. 1982\)](#), aff'd in part and rev'd in part, 710 F.2d 1551 (Fed. Cir. 1983). In *Deere*, the district court found no evidence that the patentee would have made the decision to curtail the more profitable product although they could have done so. [Id.](#) at 407. In *Water Technologies*, the Federal Circuit found no manufacturing capability and refused to award lost profits in part because the patentee had no facilities to manufacture the product commercially. 850 F.2d at 673. Under Polaroid's theory, the patentee in *Water Technologies* could have met its burden by showing, even under the most improbable scenario, that it could have built a production facility. The law is not so easily satisfied.

While it may have been physically possible to match Kodak's volume if Polaroid began to greatly expand its manufacturing capacity from the moment the infringement began, Polaroid has not proven its ability to do so. What is physically possible [*121] does, however, serve as a starting point for determining what reasonably could or would have occurred. In this analysis, Polaroid is entitled to every benefit of the doubt. [Del Mar Avionics](#), 836 F.2d at 1327; [Lam, Inc.](#), 718 F.2d at 1065. Polaroid need only show that it is more likely than not that it would have added the necessary manufacturing capacity. The Court must assume that Polaroid would have labored to meet the demand to the best of its ability.

Of course, the question of Polaroid's ability to expand manufacturing capacity in a timely manner involves not only the company's theoretical technical and physical potential, but also its forecasting and decisionmaking skills. The task is not to determine what any corporation with Polaroid's assets could have achieved, but rather to find what Polaroid, with its unique corporate personality, would have done in a world without Kodak. In this sense, what Polaroid could and would have done may be the same thing. Mr. Zaffino, Kodak's camera manufacturing expert, put it this way:

In my analysis I have determined [*122] what Polaroid realistically and reasonably could have done given all the resources at their disposal and given all the things they did well and things they didn't do so well.

And in my mind, with that understanding, I see no difference between what Polaroid reasonably and realistically could have done and what they would have done.

(TR 8903). With these principles in mind, I now turn to the facts.

Factual Findings and Conclusions

A. Film Manufacturing

Introduction

Instant film is the key to Polaroid's integral film system. The film is, in and of itself, a fascinating mini-darkroom which must be created with the utmost precision and care. Polaroid designed and built the assembly machines which manufacture its instant film, each machine bigger than my courtroom. These complicated instruments assemble all the principal film components: the positive and negative sheets, the developer pod, and the mask or frame. The machines also cut and seal the individual film units and assemble them in packs of ten with a battery, spring, and cover sheet. The machines are automatic and completely synchronized. They are driven by one shaft which runs along the length of the machine; [*123] each turn of the shaft completes one cycle of each sub-assembly station. Packaging is done at the very end, by another connected machine.

Since 1972, Polaroid has produced all the major components for its film: the negative sheet or base, which is the photosensitive material that captures the image; the positive sheet, where the image is formed and upon which the developed picture is viewed; the developer pods, which contain the chemicals that control the developing process; and the batteries, contained in the film pack, which power the camera.

Negative preparation is done on a complex coating machine, called the "x500," which is five stories high and several hundred feet long. Unlike positive sheet coating, which is done one layer at a time, all the chemical layers of the negative sheet are applied simultaneously to a sixty-inch web of material which runs through the machine at a speed of several hundred feet each minute. Because many of these layers are light-sensitive, the operation must be performed completely in the dark. Polaroid designed and built a special facility in New Bedford which houses the negative coating machine and is itself part of the negative sheet apparatus. [*124] The entire process must be completely pure and free of dirt. After coating, the negative material must be aged for six months in a special humidity and temperature controlled environment. Beginning in late 1979, with the advent of Time Zero film, Polaroid prepared part of its negative base in Building W-5 in Waltham on one of the positive coating machines and then transferred this partially-coated negative base to New Bedford for completion.

The positive sheet is prepared by coating successive layers of chemicals onto a base web sheet. The positive coating and drying machines are hundreds of feet long and several stories high. The web passes through the applicators at several hundred feet a minute. After the first chemical layer is applied to the web, it is dried and re-wound and the process is repeated until all the required layers have been coated on the sheet. During the infringement period, Polaroid housed all its positive coating facilities in Building W-5 in Waltham.

Polaroid also manufactured the card-like batteries which were included in the film pack to power the camera. The batteries were assembled on separate machines and then fed into the film assembly machine for packaging [*125] with the film.

In order to manufacture film, Polaroid needed a sufficient supply of each of the components, sufficient assembly machines, and trained employees to operate and maintain the machines. Without any one of these resources, film production would come to a halt. Therefore, my analysis takes into account each of these factors.

Polaroid's ability to manufacture integral film also depends heavily on the effectiveness of its planning process. Polaroid planned its integral film production each year based on a sales forecast. From that forecast, Polaroid prepared a "finished goods" plan and determined the manufacturing requirements for each component. Planning was necessary at successive levels to integrate the numerous operations in the manufacturing process. I have also considered how Polaroid's planning ability affected the company's manufacturing capacity. Of course, to the extent that it is possible, I have tried to ferret out Kodak's influence on that process.

First, I will consider what untapped resources Polaroid had in place during the years of infringement. Next, I will determine whether and when Polaroid could have expanded its manufacturing capacity.

1. Polaroid's [*126] In-Place Capacity: Film

Both parties presented an analysis of what incremental production Polaroid could have achieved without investing additional capital. Using the resources Polaroid historically had at its disposal, ²² Mr. McNamara for Polaroid and Messrs. Smith and Cook for Kodak, calculated how many additional film packs could be squeezed out of Polaroid's existing operation.

22 The only difference in terms of historical resources in the two analyses is that Kodak used thirty-eight film assembly machines and Polaroid used forty-two. Polaroid actually produced film on thirty-eight assembly machines in R-2, Enschede, and for a brief period in Ireland. Another four machines were partially completed but never used for production. Mr. McNamara included those four in his in-place analysis. Mr. Smith did not. Because I am using the in-place analysis to determine what extra production Polaroid could achieve from its historical resources, I find Mr. Smith's number more accurate.

(a) In-Place Capacity of [*127] Assembly Machines

Mr. McNamara, whose experience with manufacturing operations is limited to the accounting work he has done for various clients of Arthur Young & Co., prepared what he called a "fanciful" (TR 3350) schedule in which Polaroid ran its existing operations 353 days a year in every year of the infringement period. Mr. McNamara and his team arrived at these parameters by analyzing Polaroid's historical records and speaking to various Polaroid personnel. Based on the information they gathered, the team estimated how much additional "runtime" was available on the assembly machines and how many packs of film could therefore be produced. Mr. McNamara concluded that even by running 353 days a year in every year, Polaroid could not have satisfied the combined demand for instant film. This analysis was not intended to provide a serious estimate of what Polaroid could achieve, but rather to show that even based on the most optimistic assumptions, Polaroid needed something more in order to meet demand. (TR 3221). However, the basic elements of Mr. McNamara's analysis -- how much a particular machine can be expected to produce, how much time is actually available to produce film, [*128] and the availability of components -- appear again in both his nine-month and eighteen-month advance scenarios, which are intended as a serious estimate of Polaroid's additional manufacturing capacity. Therefore, I believe it is prudent to examine these assumptions now.

Kodak presented its in-place capacity analysis through Mr. David R. Smith and Mr. Wendell Cook. Mr. Cook analyzed the incremental in-place capacity of Polaroid's negative and positive sheet facilities as well as its battery production capability. Mr. Smith analyzed the in-place capacity of Polaroid's film assembly machines. Together they prepared a chart which sets forth the incremental in-place capacity in all four of these areas. The chart identifies which part of the film manufacturing operation presented the most significant constraint in each year. (DF 61,300B, Tab 2).

At the time of the trial, Mr. Smith headed Kodak's Automatic Machine Systems Design Division, a consulting group within Kodak which designs automatic machinery systems for companies other than Kodak. He was also the Director of Kodak's Converting and Packaging Line of Technology. From 1971 to 1976, he worked on the design and installation of Kodak's [*129] instant film assembly machines. Mr. Smith presented a painstakingly detailed and thorough analysis of the additional time available to Polaroid to produce film to meet market demand, and the number of additional film packs Polaroid could produce in that time. Like Mr. McNamara, Mr. Smith concluded that Polaroid could not satisfy 100% of the demand for instant products. Mr. Smith also concluded that Polaroid was capable of producing more film with its existing capacity during the infringement period.

Mr. Smith's analysis is sound and reliable. He started with the basics, examining daily shift reports to determine how the assembly machines were being used. Just as Polaroid managers did historically, he divided assembly machine use into "scheduled" and "non-scheduled" time. Of the scheduled time, Mr. Smith determined how much was spent producing "good" product and how much was taken up by unplanned stops and producing unsalable product. He further analyzed the non-scheduled time and determined what portion of that time was available for additional production. Mr. McNamara's analysis differed in one important respect: the portion of non-scheduled time allotted for additional production. [*130] This disagreement highlights the reason I find Mr. Smith's analysis so compelling.

There were reasons why Polaroid did not "schedule a machine" other than not needing it for production. Sometimes a machine sat idle because there was no one to run it, such as during a holiday or a storm. Sometimes a machine was idle because it was awaiting maintenance or updating or conversion of parts of the machine. In attempting to expand production, Polaroid could not avoid these particular "downtime" activities. Mr. McNamara and Mr. Smith differed as to whether Polaroid would have been able to eliminate much of the "no coverage time," the time required for machine updating and conversions, and the time production stopped because materials were not available. Especially in the later years, Mr. McNamara and Mr. Smith disagreed about whether Polaroid would have converted some machines to make products besides instant film.

No coverage. Polaroid could not "schedule machines" when it had no one to run them. When employees for whatever reason, did not attend work, Polaroid was unable to staff the machines and those machines would be placed on "no coverage" status. Polaroid experienced a significant [*131] amount of no coverage time throughout the infringement period.

No coverage time peaked in 1978. At that time, Polaroid was operating on a three-shift, five-day schedule but was so pressed to produce film that it was actually running seven days a week on overtime. The company also cancelled the annual vacation shutdown in July. Faced with the prospect of no vacation from this demanding schedule, employee absenteeism increased. A 1978 employee survey showed a high level of employee stress from overwork. (DF 25,371). When Polaroid replaced the overtime work with regularly scheduled shifts, "no coverage time" decreased.

The question is whether Polaroid management, under different circumstances, could have reduced the no coverage time and produced additional film packs. Mr. McNamara assumed that the increased demand would

have prompted Polaroid to adopt a seven-day schedule earlier, in January 1978. Mr. Smith "struggled with this one" (TR 10303), but concluded that since Polaroid historically faced more demand than it could handle during those months and yet did not respond, it is unlikely that the combined demand would have made any difference in how Polaroid acted.

On the basis of [*132] its historical performance, I find Polaroid could not have reduced no coverage time if faced with additional demand. Nothing in the record convinces me that Polaroid could have managed employee absenteeism any better in more demanding circumstances. Polaroid management had to experience extensive no coverage time in 1978 before it corrected the problem. Once Polaroid recognized the need for the off-standard schedule, it took almost nine months to implement it. To begin the new schedule in January 1978, as Mr. McNamara envisions, Polaroid would have had to recognize the need in the spring of 1977. Nothing in the record persuades me that Polaroid reasonably could have taken this step earlier than it actually did.

No material time. Polaroid also took machines out of the production schedule when material was not available, when there were problems with material quality, when the wrong material was supplied, or material did not perform as expected. This "downtime" is distinct from constraints on film production imposed by a lack of material or component capacity. No material time concerns the scheduling and technical problems with the material, not the sheer ability to produce [*133] it. For example, each component in instant film must be the proper size. The combination of developer, pod, mask, and rail creates a certain gap between the positive sheet and negative. If the gap is wrong, the chemicals released from the pod may not cover the sheets completely or may leak. So while Polaroid may have had material to supply the machines, it may not have been of the right quality.

Problems of no material capacity became critical at times, especially during the introduction of new products such as Time Zero film. Technical problems coating the L coat on the negative base of the new film caused Polaroid to shut down six assembly machines in 1980.

The summary reports Mr. McNamara used as the basis for his analysis did not account specifically for no material problems before 1982. Mr. McNamara may have factored some no material time into his assessment of "runtime." (PT 3114). Mr. Smith's detailed analysis, in contrast, identified significant blocks of time in those years when production ceased for lack of materials. Polaroid could not have eliminated no material time when pressing operations to the limit. No material time is an unavoidable part of the manufacturing process. [*134] Indeed, it may be generous to Polaroid not to increase

this time given the extra strain that would be placed upon all its operations in attempting to increase production. I find that the exclusion of no material time from non-scheduled time available for additional production reflects a realistic and reasonable judgment about Polaroid's ability to manufacture more film.

Engineering updates. Polaroid consistently took machines out of production to implement engineering advances that made the machines run more quickly or efficiently. Polaroid engineers were always working on ways to improve machine performance and as they discovered and refined these breakthroughs, they installed them on their machines. Partly as a result of these updates, machine speeds increased and yields generally improved during the infringement period.

Mr. McNamara took the time used for engineering updates and added it to the total that could have been used for additional production. Yet Mr. McNamara also used the increased historical machine speeds which resulted, in part, from these updates. Mr. Smith excluded this time but gave Polaroid credit for its historical increases in efficiency and speed. [*135] I find that Polaroid could not have avoided these updates and still achieved the company's historical production totals. For example, total yield, a measure of efficiency, grew from sixty-three percent in 1976 to ninety-one percent in 1985, a forty-four percent improvement. If Polaroid had decided not to take its machines out of production for updating in those years, the effect on film production would have been devastating. At the very least, any analysis which eliminates that downtime must adjust the total yield accordingly. No such analysis was offered.

Conversion of machines to produce other products.

Polaroid used its film assembly machines to manufacture products other than consumer instant film. Polaroid also converted some film assembly machines to new processes or new integral products, such as "faceplate," a batteryless film used in photo booths, and "autofilm," a commercial product designed for use with computer terminals. Some machines were also converted to produce Spectra film and integral film with a capless cartridge.

Polaroid's analysis of non-scheduled time assumed that machine downtime for making products other than integral film would have been deferred [*136] or eliminated entirely to make more time available for instant film production. Kodak claims that there is no reason to believe that Polaroid would have passed up the opportunity to develop its non-consumer film business in order to make more integral film. I agree. In fact, at the time autofilm was introduced in 1984, Polaroid was making a concerted effort to expand its commercial and industrial business, which by then generated forty percent of the

company's revenues. Polaroid has also not accounted for any profits it earned on the sale of non-integral products. Faceplace was sold throughout the infringement period.

There is particularly strong disagreement about whether Polaroid would have put off the capless conversion of its integral film. This conversion would have molded the end cap, the flap which covered the opening of the film "box," into the film cartridge in order to prevent it from breaking off and ruining the camera. Moreover, end cap production problems were the number one cause of assembly machine downtime. The request for capital funds for the capless conversion also claimed that the molded end cap would improve the way the chemicals were distributed across the film [*137] when the pod was burst. The net associated cost savings from capless conversion was projected to be in the order of \$ 900,000 per 100 million units.

Polaroid commenced the capless conversion process by a 1-A work order, a type of order reserved for emergency projects that allowed work to begin on a capital project without Board approval. When the project began in November 1978, film production was operating seven days a week and was still unable to keep up with demand. Polaroid was also building SX-70 cameras as fast as it could at this time. The capless conversion was eventually abandoned because the machines were a disappointment and did not perform as well as before the conversion.

Mr. George Fernald, the Polaroid fact witness who testified about machine operating parameters, stated that Polaroid would have shelved the capless conversion in the face of higher demand. Mr. Fernald's opinion, however, ignores the fact that Polaroid, at the time the conversion was attempted, already faced more demand than it could handle and, because of limited film production capacity, was considering limiting camera production. On cross-examination, Mr. Fernald did not recall what the demands were [*138] on the film division at that time. (TR 2812-17). Mr. McNamara incorporated Mr. Fernald's opinion in his analysis.

I believe Polaroid could not reasonably have avoided the capless conversion. While the change was not ultimately profitable, manufacturing problems were a leading cause of machine downtime and, when the cap did break off, it destroyed the consumer's camera. Perhaps, with hindsight, the conversion seems like the type of activity that could be eliminated in favor of more machine production hours but I do not believe Polaroid should be credited with 20/20 hindsight that shows today that the attempted conversion was futile. The capless conversion time could not have been used for additional production. Mr. Smith's analysis of the new products/conversion time is sound and I adopt it.

For these reasons, I find that Mr. Smith's opinion of the incremental capacity of Polaroid's in-place assembly machines is reasonable and credible and I adopt it as fact. In each year, Polaroid would have been able to produce some additional film without expanding its facilities consistent with Mr. Smith's findings as reported in Tab 2 of DF 61,300B. Polaroid, however, would not have been able [*139] to make 100% of Kodak's sales.

(b) In-Place Capacity of Components

Mr. Cook performed Kodak's analysis of the incremental in-place capacity of Polaroid's negative and positive sheet coating and battery operations. At the time of his retirement in 1986, Mr. Cook was a Vice-President of Eastman Kodak and the general manager of Kodak Park Division, the division of Kodak which manufactures all Kodak photographic film, paper, and chemicals. Mr. Cook was the assistant general manager of that division during the infringement period. In his early days at Kodak, Mr. Cook held positions of increasing responsibility in the Roll Coating Division which manufactured photographic film base.

Mr. Cook concluded that while Polaroid could have increased its output of film and battery components in each year, it could not have produced enough to satisfy all the demand in any year except 1976.²³ According to Mr. Cook, positive sheet capacity was the most significant constraint on Polaroid's ability to produce more film in 1979. In 1980, negative base coating, the new initial coating that was performed in W-5 on the No. 9 coater, was the most significant constraint. Mr. Cook also stated that Polaroid's [*140] ability to produce the higher-powered batteries for the Sun system was the most significant constraint on Polaroid's ability to produce more film packs in 1981.

23 Polaroid could have met the requirement for negative coating in the New Bedford facility in 1982. However, in 1982, assembly machines, positive sheet, and negative base coating would have fallen short.

Mr. McNamara concluded that Polaroid had the ability to supply all the components it would have needed under each scenario he presented. However, a detailed analysis of his scenarios is missing; Mr. McNamara simply provided an unimpressive list of costs that would be incurred in the battery and positive sheet operations if Polaroid produced all the additional film. The costs result from additional shifts. The list includes one expense in 1976 for sheet and identical costs each year for seven years for batteries. (PT 2367A, Tab 17). Presumably, Mr. McNamara has made some principled estimate of what the existing resources were capable of producing and [*141] what additions he felt were required in the com-

ponent operations, but he did not present the details of that estimate to the Court. I find it very difficult to judge the reasonableness or accuracy of his conclusions about this essential part of film production capability without knowing the foundations upon which they are based.

Positive Sheet. Mr. Cook's analysis of positive sheet coating follows the same steps as Mr. Smith's analysis of film assembly. He identified scheduled and non-scheduled time and determined the amount, in equivalent film packs, that Polaroid could squeeze out of the operation by running at full tilt but without building a new coater. His conclusions about downtime are similar to Mr. Smith's. For example, Mr. Cook concluded that Polaroid would not have instituted a seven-day production schedule earlier than it did historically. Mr. Cook used the historical coating speeds and rejected the notion that Polaroid could have increased coating speeds earlier in time if faced with additional demand. He also added the capacity of the 10A tandem coater in February 1979 when it was installed historically, despite Polaroid's urging that it could have been installed [*142] earlier.²⁴

24 The 10A is an additional applicator with drying capacity which was connected to the number 10 coater. It allowed for the coating of two layers, one on each side of the web, in a single pass. As a result Polaroid was able to manufacture the positive sheet with only three coating passes in W-5.

In 1979, positive sheet coating capacity would have been the limiting constraint on Polaroid's ability to manufacture more integral film. Over the course of the entire year, only 183 reserve hours were available on both the No. 9 and No. 10/10A coaters combined. In 1978, positive sheet coating was also significantly limited. During 1978, W-5 operated virtually twenty-four hours a day, with just thirty-two hours of reserve time available that entire year. Overall, I find Mr. Cook's analysis of Polaroid's positive sheet coating apparatus to be thorough and credible. It is based on sound assumptions and conclusions which were unshaken on cross-examination.

Negative Base. When Polaroid began producing [*143] Time Zero film it had to coat part of the negative base in W-5 on the No. 9 coater. It began this operation in the second half of 1980. According to Mr. Cook, Polaroid's ability to coat negative base would have been the limiting constraint on its capacity to produce more film in that year. Because the negative sheet required six months aging between coating and assembly, only negative base manufactured during the first half of a given calendar year and the last half of the prior year will support the manufacture of finished film packs during that year. When Mr. Cook looked at what additional time he could extract from 1980, he had to examine negative

coating in 1979. Since the product had not yet been developed, no negative base was available from the second half of 1979. Therefore, the only additional film production time available in 1980 would be in the second half of 1980.

I find Kodak's assessment of negative base coating in W-5 right on track. Because I have found that Polaroid would have introduced Time Zero film when it did, incorporating the problems associated with the Time Zero changeover is accurate and appropriate.

New Bedford Negative Coating. Mr. Cook's New [*144] Bedford analysis is similar to the analysis for positive sheet; he identified those times in which Polaroid could have produced more negative sheet taking into account historical interruptions such as vacations, maintenance, running other products, and the required aging. I find Mr. Cook's conclusions about the x500's speed, length of coating runs, and total yield appropriate and reasonable despite Polaroid's arguments that it could have increased production earlier in time. I fully adopt his findings in this area.

Batteries. In 1981, Polaroid began the transition to using a new kind of battery, the P-80, to power the new Sun cameras which required more energy. However, because the P-80 was not ready in time for the Sun introduction, Polaroid modified its old battery, the P-70, by adding more active ingredients. Unfortunately, a contamination problem, discovered earlier, was much more pronounced in this modified battery. Consequently, Polaroid workers spent a great deal of time sorting out the bad batteries and Polaroid shipped some batteries that lacked the proper aging. Because of these problems, the reserve time and yields were very low in Mr. Cook's analysis.

Nothing [*145] in the record suggests that Polaroid could have avoided the battery problem in a Kodak-free marketplace. Indeed, Polaroid has claimed that it would have introduced the Sun system even earlier so it is possible that these development problems would have been even more pronounced. Therefore, I believe Mr. Cook's analysis in this regard is credible and sound.

Conclusion

I find that Kodak's analysis of Polaroid's ability to produce additional film packs from existing resources is reliable and compelling. It is based on thorough research, well supported by Polaroid documents and the statements of Polaroid insiders. By meticulously identifying the basis for their judgments about how Polaroid could reasonably have increased production, Kodak's experts have given the Court confidence that their analysis is sound and fair.

2. Polaroid's Potential Film Manufacturing Capability

Polaroid presented two scenarios to show how it "would" have increased manufacturing capacity to meet the combined demand for film in a "but for" Kodak world. One accelerates the company's historical capacity decisions nine months and the other advances the decisions eighteen months. I cannot adopt the results [*146] derived from either scenario because the analysis includes the same unrealistic estimates of runtime parameters that comprised Polaroid's in-place capacity illustration.²⁵ Therefore, were I to adopt Polaroid's assertions that additional resources could have been brought on line earlier, I would be left on my own to calculate how many additional film packs could have been produced under more reasonable operating parameters. Given the complexity of these calculations and the fact that I was often presented with only the results and not the raw materials for the calculations, it is nearly impossible to accomplish this task with any precision.

25 The average yield and runtime percentages are the same in Mr. McNamara's in-place, nine-month and eighteen month scenarios. (PT 2367A, Tab 23, Tab 25; PT 2393).

Kodak presented an analysis of Polaroid's potential capability consistent with its theory of demand. Kodak experts crafted scenarios and performed calculations showing: (1) a progression of five, fifteen, and [*147] sixty percent of Kodak's sales; (2) twenty-five percent of Kodak's sales; and (3) fifty percent of Kodak's sales. Mr. Gene Brown developed hypothetical forecasts for Mr. Cook that simulated Polaroid forecasts given these three levels of demand. Following Polaroid's practice of planning production for twenty percent over forecast, Mr. Cook predicted what capital decisions Polaroid would have made. Having decided the start dates, Mr. Cook calculated the length of time required to bring on line new component manufacturing capacity. Mr. Smith calculated the same for assembly machines. The resulting additional film packs appear at Tabs 3, 4, and 5 of Mr. Cook's report. (DF 61,000A; DF 61,000B).

Unfortunately, those calculations are also not helpful to me because I have rejected Mr. Brown's demand estimates. At my urging, Mr. Cook and Mr. Smith were asked their opinions about how much additional production Polaroid could achieve if faced with 100% of the demand. It is their answer to this question which I compare next against Polaroid's claims about the speed with which it could have brought additional manufacturing capability on line.

Mr. Smith believed that even if Polaroid tried to [*148] meet 100% of combined demand, it could not have increased the number of assembly machines at all

between 1976 and 1978.²⁶ From 1979 to 1981, Mr. Smith opined that Polaroid probably could have produced slightly more film packs than under the fifty percent demand scenario. From 1982 on, he believes Polaroid could have met all of the combined demand.

26 Kodak agrees that Polaroid had all the capacity it needed to meet the combined demand for film in 1976.

Mr. Cook claims that because of the long lead times required to build the coating machines, even if faced with 100% of demand, Polaroid would not have been able to increase manufacturing capacity for positive sheet until mid-1979, and would not be able to increase negative coating capacity until mid-1980. He did not comment specifically on battery capacity under these circumstances. Moreover, Mr. Cook pointed out that if Polaroid did build new negative and positive sheet coating machines, the costs of those machines must be included in the lost profits calculation.

[*149] (a) Film Assembly Machines

1977-1978. Mr. Smith concluded that even if Polaroid faced all of the combined demand, the company would have been unable to bring film assembly machines on line any faster in 1977 and 1978 than it did in the real world. His analysis of all demand levels shows that with reasonable consideration of the time required to order parts and build the machines, and considering the availability of qualified people to operate the machines, Polaroid achieved the most that could be expected. The schedule could not be accelerated.

If Polaroid had started constructing some machines earlier than it did historically, it might have increased production in those years even using Mr. Smith's building rates. However, I find that it is not probable that Polaroid would have (and therefore not likely that it could have) started a sufficient number of machines to make a difference during these early years, 1977 and 1978.

The time required to bring machines into production. The key to Mr. Smith's conclusion that no additional assembly machines could be brought on line in 1977 and 1978 is his analysis of the time required to bring the machines into production. [*150]²⁷ Mr. Smith's timelines differed considerably from those presented by Polaroid.

27 Both Polaroid and Kodak agree that the maximum rate at which Polaroid could install machines at any particular facility was one a month. Therefore, the key is how quickly the first machine can be ready. The rest follow at a rate of one a month.

Mr. Lawrence, who at critical times in the infringement period served as program manager at Polaroid's equipment facilities division, devised an illustrative construction schedule from starting dates provided by Mr. McNamara. When the infringement began, twelve film assembly machines (Nos. 13-24) were in various stages of completion. Except for machine No. 17, Mr. Lawrence shortened the time it actually took to bring each machine into production. For example, it took ten months to bring machine No. 13, which was partially completed when the infringement began, into production from its authorization date in April 1976. In Mr. Lawrence's illustrative schedule, the machine could begin producing [*151] film in only three months. The schedule considerably shortened the time required for the initial paperwork, to order and receive parts, and to assemble crews. (See TR 2955-57; 2961-66; 2970-74).

Mr. Lawrence believed that Polaroid could have accelerated its schedule although the bulk of evidence shows that Polaroid was building as fast as it could and was still unable to meet demand. In the spring of 1977, the film division was operating at maximum capacity and Polaroid management requested that the engineering division bring machines into production as quickly as possible. (PT 2328). Although Mr. Lawrence's shop worked very quickly and efficiently and they were able to bring some machines on line earlier than they had planned, they could not have worked any faster. For these reasons, I think Mr. Lawrence's schedule is improbable.

Mr. Smith concluded that Polaroid could not have completed any of the twelve partially-completed machines in R-2 any earlier than they were completed historically. With extensive documentation, Mr. Smith showed the difficulty that Polaroid faced in obtaining parts for the machines, some of which had been borrowed from other, idle machines. Time-consuming [*152] drawings were needed in order to fabricate some of the required parts. Moreover, despite repeated requests from the film division to get these machines into production sooner, Polaroid was unable to accelerate their installation. (TR 10214; DF 61,342 at 119-21). For these reasons, I agree with Mr. Smith. Polaroid could not have brought those machines into production more quickly than it actually did.

Although Polaroid never completed a machine in less than twenty months, Mr. Lawrence estimated that some new machines could be constructed in as little as twelve months while others might take up to seventeen months. Giving Polaroid the benefit of the doubt on some evidence, Mr. Smith estimated that new machines would take an average of eighteen months to build. The difference in their conclusions is directly related to differences in their assumptions. Mr. Lawrence assumed

that Polaroid would not encounter any resource constraints and that skilled engineers and parts would be available precisely when needed. Mr. Smith closely examined the lead times for parts and took into account the difficulty Polaroid experienced in obtaining skilled personnel. Kodak's analysis is realistic and more [*153] accurately represents what Polaroid could have achieved.

Machine starting dates. Having found that Kodak's timelines best represent how quickly Polaroid could bring the machines into production, I now examine Polaroid's claim that it would have authorized machines at an earlier point in time.²⁸

28 It is unclear to me whether it is Mr. Smith's view that Polaroid could not have expanded capacity in 1977-1978 under any of Polaroid's scenarios. In PT 3156, Polaroid shows how additional film packs could be produced during this time period using Mr. Smith's building rates and starting machines 13-24 in January 1976. However, at TR 10245 and again at 10504-506, Mr. Smith indicated that his timelines do not apply if one assumes that all the machines are started at once because that assumption does not allow for the borrowing of parts or the benefit of experienced building teams. As I do not find Polaroid's scenarios likely, it is not crucial that I resolve this matter.

The "could v. would" problem [*154] *revisited.* Before I compare the parties' assumptions regarding when machines could have been started, it is important to point out the ambiguity in Polaroid's approach which makes it difficult to judge whether its dates are feasible. I have doubts about whether Polaroid is really trying to describe the relationship between demand and decision-making when it posits the dates on which it would have started the machines. Polaroid's analysis appears to be backwards. Statements in the record lead me to believe that Polaroid simply tried to determine the dates upon which it must have necessarily begun in order to meet the demand, without taking into account the feasibility of that expansion. The two relevant Polaroid witnesses who testified on this point were Mr. McNamara and Mr. Booth.

Mr. McNamara gave his expert opinion about how far to advance Polaroid's capital decisions in the calculations presented. Upon hearing his direct examination, I believed that he had completed a scaled-down version of Kodak's analysis, looking at the historical relationship between demand and capital decisions and, by changing the demand, predicted the corresponding capital decisions. Mr. McNamara gave [*155] this explanation:

A. What I'm reporting here is that in looking at the historical record of Polaroid and its response to increases in demand that it was experiencing in connection with its integral film, I compared that to an analysis of the combined -- of the increases in the combined volume of Polaroid and Kodak film and made an analysis which showed me that in the real world when the volumes of Polaroid film reached a certain level, they started to undertake a rapid expansion program to bring more machines on line.

In comparing that to the same level of the combined Polaroid/Kodak increases in demand for film, this is actual production, I notice that that time period was approximately nine months earlier.

I then concluded, Let me try to make a calculation which would assume that Polaroid, recognizing the increase in demand represented by the combined volume, would have responded as it did in the real world at that point in time with a schedule making machines available nine months earlier. So that the authorization dates would be moved up nine months.

(TR 3223-24). But upon cross examination, Mr. McNamara seemed to retreat from saying he determined how Polaroid would [*156] have responded to the combined demand. At TR 3346-47, he began with the same explanation given earlier, and even stated that he had graphed the historical relationship between demand and capital decisions and then plotted the combined demand on the same graph to show that Polaroid would have reached the same capital decisions nine months earlier.²⁹ Then, he seemed to retreat:

Q. So you yourself, formed no opinion as to whether Polaroid's management would have made these decisions nine months earlier or 18 months earlier than they actually did?

A. What I did was to look -- that fact that at a point in time Polaroid management made a decision, a series of decisions, those decisions were to expand capacity on a rapid basis. I looked at that as I just described, and moved that decision point back nine months. I also moved it back 18 months.

Q. Right. Just so we're clear. You're not offering an opinion as to whether Polaroid's management would have made those decisions nine months earlier or 18 months earlier than they actually did?

A. What I am saying is that could have, based on the historical record as to what actually happened when it happened.

Q. So as to [*157] this aspect of your study, you're talking about what they could have done, not in fact what they would have done?

A. That's their decision point.

(TR 3352-53). It is unclear to me whether Mr. McNamara simply counted backwards from the production requirements he wished to meet or whether he offered a principled scenario about how Polaroid could have expanded to meet the demand. The most favorable reading I can give his testimony is that he believes that, consistent with the way Polaroid responded to demand in the past, Polaroid reasonably could have added resources anywhere from nine months to eighteen months earlier if faced with the combined demand. Unfortunately, Mr. McNamara has given the Court very little support for that conclusion.

29 No such graph was presented to the Court or admitted into evidence.

Mr. McNamara's eighteen-month advance scenario had its genesis in the trial testimony of Mr. Booth regarding the OneStep camera. Mr. Booth testified that if Polaroid had planned the introduction [*158] of the OneStep in a Kodak-free market, it would have predicted the surge in demand for film, and it would have begun gearing up the film operation eighteen to twenty months earlier. Although I have found that Polaroid would have introduced the Onestep when it historically did, it is possible that Polaroid would have planned better without Kodak and Mr. Booth's testimony in that regard is illuminating. If this had been his only testimony, my task would be simple enough: to judge whether Mr. Booth's opinion about Polaroid's abilities to forecast and plan are credible and consistent with the rest of the record. However, Mr. Booth went on to testify about Polaroid's response to the combined demand for the whole infringement period, of which the OneStep is only one part. Here, he did not give the Court an opinion about when Polaroid would have begun to increase production. Instead, he seemed to say, looking backwards, how much time Polaroid would have needed to meet the combined demand:

Q. Mr. Booth, if you were called upon to ask the -- to ask the manufacture [sic] to combine volume of the Polaroid and Kodak's instant film and cameras during that time period, can you tell the court [*159] what you would have needed in lead time in order to do that?

A. I think in the same 18-month period that I'm just talking about, 18 months to 20 months.

(TR 2301-302 (emphasis added)). Again, I am unsure about whether Mr. Booth is testifying that Polaroid would have advanced all capital decisions eighteen months or whether he believes eighteen months advancement is what the calculations require. Mr. McNamara used this testimony as the basis for advancing all capacity decisions by eighteen months.

In any case, Polaroid must prove, by a preponderance of the evidence, that it had the potential capability to meet the demand. [Bio-Rad Laboratories, 739 F.2d at 616](#). The vague and unconvincing evidence tending to show the likelihood that Polaroid would have made these decisions earlier handicaps its proof on this issue.

Under the nine-month scenario, Polaroid claims it would have authorized machines numbers 13-24 all in April 1976. Except for Mr. McNamara's study, there is no direct support for this assertion. On the contrary, a great deal of evidence shows that the scenario is unlikely. My analysis of the nine-month scenario applies a fortiori to the eighteen-month [*160] scenario which calls for twenty-four machines to be authorized in January 1976, before the infringement even began.

Polaroid added film assembly machines on the basis of requests from the film division which, in turn, based its requests upon film sales forecasts derived from forecasts of camera sales. I do not believe Polaroid is legally entitled to credit for perfect foresight in this hindsight analysis of potential capability. Therefore, I must consider Polaroid's forecasting and planning capabilities as part of its manufacturing capability. In order to find that Polaroid could have authorized all twelve machines in April 1976, I have to find that it reasonably could have predicted the demand that was to follow.

In general, Polaroid's ability to forecast sales was poor. Mr. Booth claims that Polaroid would have predicted the demand for film that would have been generated by the OneStep, but this is contrary to Polaroid's experience with the introduction of other models.³⁰ Polaroid's sales forecasts were inaccurate even before the infringement began. Forecasts were off on the SX-70 and, even in the pack era, Polaroid had trouble meeting the demand for its popular Swinger and [*161] Color-pack II cameras. Polaroid's inability to forecast was unrelated to Kodak's entry; Polaroid failed to accurately forecast sales before, during, and after the infringement period. (TR 8633-34 and related charts).

30 I note that I am giving Polaroid the benefit of the doubt by considering the first part of Mr. Booth's testimony to apply to what Polaroid has termed the "Panduit theory." In its post trial papers at Facts IV-13-14, Polaroid cites all of Mr. Booth's testimony (TR 2298-301) in support of the notion that even if Polaroid had introduced the OneStep when it did (which is necessarily part of Polaroid's Panduit theory), it would have planned better without Kodak. However, I believe Mr. Booth addressed Polaroid's capability to satisfy the combined demand only when he gave the answer quoted above. At TR 2993, counsel for Polaroid stated:

We are basically putting forward in our view what Polaroid could have done to accelerate its film capacity in terms of making film under the Panduit theory, and beyond that we say as a matter of fact, it would be very easy to accelerate it within the range which Mr. Booth testified to which was eighteen months. I believe the thrust of Mr. Lawrence's testimony does go to what is called the classic hypothetical argument that what [sic] Polaroid could have done in terms of capabilities. I think Mr. Booth's position goes to the notion of what Polaroid would have done if it had the field to itself

(My emphasis). Because the record supports the possibility that Polaroid may have planned better even with the same introduction time, I consider Mr. Booth's testimony in that light.

[*162] Although I believe Polaroid's ability to forecast was somewhat impaired by Kodak's entry, I am not convinced that it could have done better in the world without Kodak. The phenomenal success of instant photography in the late 1970s, based in part on the immense success of the OneStep and the Handle, surprised both companies. Film assembly machines are complex tools which take considerable time to design and build. Polaroid would have needed much more sophisticated forecasting and planning skills in order to have expanded manufacturing capacity in so short a period of time.

Based on Mr. Cook's and Mr. Smith's analysis of how quickly Polaroid could have responded to the combined demand, including when Polaroid would have authorized the start up of additional machines and how long it would have taken before they were in production, I find that Polaroid could have not have expanded its film assembly capacity in the years 1977-1978.

1979-1980. According to Mr. Cook's in-place capacity analysis, the most significant constraint on Polaroid's ability to produce more film in 1979 was its ability to supply positive sheet. Except for Mr. McNamara's summary treatment of the costs of [*163] supplying some components, Polaroid presented no evidence of its ability to expand its component manufacturing facilities.

In order to meet the combined demand for film in 1979, Polaroid would have had to add more positive sheet coating capacity. A new coater required at least three years to build. Therefore, Polaroid would have had to begin construction in 1976. No evidence shows that it could have done so. As in the case of film assembly machines, Polaroid would have had to forecast the need for more positive sheet long before demand materialized. I do not believe Polaroid could have predicted the need for more positive sheet coating machines in 1976.

In 1980, the most constraining area of production was Polaroid's ability to coat the negative base for Time Zero film. Negative coating machines require at least four years to build. Even if Polaroid had started another machine at the beginning of the infringement period, it could not have been productive until mid-1980. I find that Polaroid could not have planned so far in advance and therefore would not have been able to increase negative coating capability in 1980.

1981-1985. According to Mr. Cook's analysis, Polaroid [*164] was most seriously constrained in 1981 by its capacity to produce batteries. Polaroid's counsel questioned Mr. Cook about whether his opinion took into consideration that Polaroid had another battery assembly facility, W-45, which it had closed in 1980. Mr. Cook answered that he believed Polaroid management would not have invested capital to re-open the old facility because they expected the new P-80 machines to be ready soon. Although Mr. Cook's analysis seems plausible, I find that Polaroid reasonably could have re-opened the old facility. No new machines were required, as in the case of film assembly or sheet coating. Mr. Cook testified that reopening the old facility simply required updating the machines and hiring new employees to operate them. Mr. Cook did not specifically explain how he thought the combined demand would affect this decision. It is reasonable to conclude that Polaroid could have taken this simple step. Of course, any costs associated

with re-opening the facility will have to be accounted for in the lost profits calculation.

Giving Polaroid every benefit of the doubt, I find that the company could have manufactured enough film to satisfy demand from 1981 to 1985. [*165] Mr. Smith testified that in the case of 100% of demand, Polaroid could have increased capacity slightly from 1979 to 1981 and completely satisfied demand from then on. My findings are more generous to Polaroid both because I am not sure whether Mr. Smith took into account that Polaroid may have planned better for the Onestep, and because I believe that given enough time, the record shows that Polaroid's manufacturing operations were impressive. The parties disagree about the conversion of machines to autofilm and Spectra which began in 1982 and by 1985 accounted for a total of nine machines. I find that Polaroid still would have converted these machines but by 1981 it would have had adequate time to build and install replacements. The cost of this build-up is included in the lost profits calculation.

I also conclude that Polaroid could have added sufficient sheet and negative coating capability by 1981. Of course, the lost profits calculation takes into account the cost of those machines.

Conclusion

I find Polaroid's ability to manufacture additional film packs is as follows: ³¹

1976	2,557,500 packs
1977	5,571,000 packs
1978	49,000 packs
1979	1,486,000 packs
1980	775,000 packs
1981-1985	sufficient to meet demand

[*166]

31 Kodak reduced Polaroid's capabilities in each year by 4.3% to account for Polaroid's free goods and inventory pipeline needs. Polaroid, however, demonstrated that this number was not accurate. Therefore, I have not used this part of Kodak's analysis.

B. Camera Manufacturing

Introduction

Manufacturing each hard-bodied Polaroid camera during the infringement period required assembling approximately 125 different parts supplied by between fifty and seventy-five different outside vendors located around the world. Sub-assembly and final assembly were done by hand. ³² The resources needed for making the

cameras were piece parts, workers, factory space, and some assembly and test equipment. After assembly, Polaroid tested the product, packaged and shipped it.

32 From 1976 to mid-1979, final assembly of all integral cameras made in the United States was done in Building N-1 in Norwood, Massachusetts. In 1977, Polaroid began assembling non-folding integral instant cameras in its facility in Vale of Leven, Scotland. In mid-1979, Polaroid moved its U.S. assembly operation to a new facility, N-4, also at the Norwood site.

[*167] Three critical factors influenced the number of cameras Polaroid could produce: (1) the suppliers' ability to produce parts; (2) the number of workers employed; and (3) the rate at which Polaroid employees could assemble cameras. The parts were produced by special tooling machines such as dyes, jigs, fixtures, and molds, and so the number of tooling machines largely determined how quickly parts could be produced. In 1976, Polaroid's suppliers had tooling to produce 15,000 sets of Pronto! parts per day on a five-day schedule. By June 1978, tooling capacity had tripled and suppliers were producing up to 50,000 sets of Pronto! and OneStep parts per day. To increase tooling, Polaroid had to authorize the funds and order the tools. Depending on the complexity of the tool, it could take considerable time before the tool was ready and even longer before additional parts reached Polaroid from the supplier. Within the constraints of an existing tooling compliment, the rate at which the supplier could purchase raw materials and the number of hours it could run the machines determined the level of output.

Polaroid was able to increase the size of its workforce at a significant rate. In the [*168] period 1977-1978, Polaroid hired over 100 people each week in the camera division. Still, depending on the job, it took between one and six weeks to train new workers. During the years of peak demand, the attrition rate was high in the camera division, partly because workers transferred to the higher-paying film division, and partly because hiring at such great numbers increased the likelihood of employing workers who only stayed for a short period of time or who were not suited for the job.

The assembly rate was not only affected by new workers but also by the product mix, how much overtime the assemblers had worked, the amount of product that had to be reworked, and the typical "technical surprises" which slowed down the operation.

1. Polaroid's In-Place Capacity

Polaroid's chief camera manufacturing witness was Howard J. Fortner. From 1971 through 1980, Mr. Fortner

held positions in the camera engineering and folding camera manufacturing areas at Polaroid; his responsibility for the production of Polaroid's hardbody integral cameras began in 1981. Except regarding his analysis of Polaroid's manufacturing capacity in Scotland, Mr. Fortner did not review any of the deposition [*169] testimony of Polaroid executives responsible for camera production and planning during the critical time period of 1976-1980. Mr. Fortner also did not review the depositions of any of Polaroid's parts suppliers, nor did he review any of the contemporaneous records concerning the supply of camera parts to Polaroid. (TR 1812-13).

Using his own estimates of the production rates Polaroid could achieve, Mr. Fortner constructed two scenarios. First he analyzed both Polaroid's in-place capacity and potential capacity if additional tooling had been authorized eight months earlier. In a third scenario, Mr. Fortner prepared an expansion scheme which could meet the combined demand in every year. This required advancing Polaroid's capital investment decisions twelve months.

Mr. Fortner's in-place capacity analysis calculated the increased production Polaroid could have achieved without changing the timing of any decisions to increase tooling. Despite overwhelming testimony that in the years 1976-1978 Polaroid was producing as many cameras as it could, Mr. Fortner testified that Polaroid could have manufactured more cameras by assuming that the highest historical daily production rate -- for [*170] example, in January 1977 -- would be matched every month thereafter until a higher rate was achieved.³³ In this example, production next historically exceeded the January 1977 rate in June 1977. Thus, in Mr. Fortner's scenario, the January rate would apply in February, March, April, and May. Historically, however, production did not equal the January rate in those months.

33 The historical daily production rate that Mr. Fortner used is also questionable because it is based on the number of cameras divided by the number of days scheduled -- but not the actual number of days worked. In 1976-1978, when Polaroid was often working thirteen out of fourteen days, this flaw leads to a considerable overstating of Polaroid's capabilities. Because statistics on the number of days actually worked were available to Mr. Fortner, I find this calculation troubling. It only serves to undermine confidence in the reliability of his results.

Mr. Fortner presented no sound basis for this assumption. On cross-examination, he tried [*171] to explain that his chosen production rate reflected typical efficiency factors, yet he also acknowledged that the rate reflected months of peak efficiency. (TR 1880-81). Mr.

Fortner also assumed that the historical fluctuations attributable to schedule changes would not occur in his scenario. (TR 1881-82). Yet, the cross-examination showed that these fluctuations were sometimes caused by events beyond Polaroid's control or resulted from problems that would have occurred even without competition from Kodak. (TR 1851-900). When confronted with the fact that his analysis did not take into account reduced efficiency resulting from the introduction of the complicated Sonar camera, Mr. Fortner conceded his assumptions were "a little less reasonable than I thought." (TR 1989).

A large portion of the excess capacity Mr. Fortner was able to squeeze out of the historical capacity in the early years came from assuming the highest historical production rate would apply in months where Polaroid traditionally curtailed production in accordance with its "seasonalization" policy. Polaroid always built up its inventory before the Christmas selling season and lowered it during the first part of the [*172] year. Mr. Fortner confirmed that Polaroid's policy of seasonalizing production was prompted not by Kodak but rather by the requirements of the marketing operation. (TR 1749). Even when running flat out and unable to meet demand in 1978, Polaroid seasonalized its production. (DF 25,329; PT 2274). Still, Mr. Fortner admitted:

And what we showed in our first scenario was that we could, in fact, make some more cameras but we had to make them early in the year.

(TR 1892).

In the years 1977 and 1978, Mr. Fortner's in-place analysis also assumed that Polaroid could increase its parts supply by twenty percent by asking its vendors to work six instead of five days. While the record is uncontested that Polaroid's suppliers were willing to do almost anything for Polaroid, Mr. Fortner did not know that at least one critical supplier was already working seven days a week. (TR 1964-79). Another was working six days just to support Polaroid's five day schedule. (TR 1964-79). Mr. Fortner's assumptions in this regard directly contradict the record and discredit his assessment of in-place capacity in those years.

Mr. Fortner concluded that by running the vendors six days a week, not seasonalizing [*173] production, and somehow achieving peak efficiency at all times, Polaroid could have manufactured 1,751,000 more cameras in the years 1976-1978. This conclusion is based on unsupported assumptions and is not credible.

"Could v. Would" Revisited (Again). In his second scenario, Mr. Fortner assumed that Polaroid would have made each of the decisions it did historically to increase tooling about eight months earlier:

Based upon the fact that the OneStep camera was going to sell for less money than the Pronto camera, we made -- similar to our pack camera lines, we made the assumption that we would bring the tooling authorization to 30,000 a day forward from when it was actually done until -- to the point when we started development of the OneStep camera. So we moved that tooling authorization from December of 1977 to April of 1977.

(TR 1775-76). Polaroid's counsel elicited from Mr. Fortner that he had been somewhat involved in the camera division's decisions to request additional tooling. But, the camera division based its requests on sales forecasts from the marketing division. In order to move the tooling decision up in time, either Mr. Fortner is making assumptions [*174] about what forecasts marketing would have given the camera division, or he is offering his own opinion about what Polaroid would have forecast. Either way, his opinion is not well-supported. While it is reasonable to believe that alone in the market Polaroid might have planned the OneStep introduction better, Mr. Fortner is not qualified to offer an opinion about how Polaroid would have predicted sales. It is not his area of experience or expertise. Upon cross-examination, Mr. Fortner further muddled the waters by testifying that he was only trying to address the question of what additional cameras Polaroid could have made, not what it would have made. (TR 1920).

In his third scenario, Mr. Fortner admitted that he just counted backwards in time to the dates upon which tooling authorizations would have to have been made in order to manufacture the combined demand. (TR 1972). He concluded that the entire process had to be moved up twelve months. Given the extensive evidence of the complex factors involved in Polaroid's decisions to add capital, Mr. Fortner's calculation, which by definition ignores those factors, is not helpful to the Court except as a theoretical exercise.

[*175] Mr. McNamara presented yet another scenario which accelerated the tooling levels by eighteen months. He did so based upon the same testimony by Mr. Booth which I discussed in the film manufacturing section. For the same reasons I delineated there, I find that testimony unreliable. I also find that Polaroid could not have predicted sales or planned with such accurate foresight.

Both Polaroid's machine operation parameters and starting date scenarios are flawed. Even if one part of the scenario was plausible, it would fail because of the other.

Kodak's expert in this area was Mr. Frank Zaffino. At the time of the trial, Mr. Zaffino had more than twenty-six years experience in camera manufacturing. In the course of his career, he has been directly involved in every aspect of the camera manufacturing process, in-

cluding camera assembly, tool manufacturing, parts procurement, capacity planning, and production planning. From 1976 to 1978, Mr. Zaffino was directly responsible for the manufacture of Kodak's instant cameras. For his analysis of Polaroid's camera manufacturing capacity, Mr. Zaffino undertook an extensive review of all of the relevant testimony, depositions, and evidence. Mr. [*176] Zaffino personally inspected Polaroid's facility at Norwood.

Mr. Zaffino worked from the same series of sales forecasts as Mr. Cook -- those devised by Mr. Brown to reflect what Polaroid executives would have forecast if the company was alone in the market and experiencing various degrees of incremental demand. Based on his review of Polaroid's decision patterns, Mr. Zaffino determined what capacity planning decisions Polaroid's management would have made if faced with Mr. Brown's forecasts for each of the three demand scenarios.

Mr. Zaffino built a production model which incorporated these various decisions. He analyzed the availability of three key camera parts: the cone, the door, and the electronics flex circuit. Using Polaroid's actual lead times for increasing tooling for these parts, actual cycle times for obtaining these parts from vendors under expedited conditions, and actual scrap rates for these parts, and using the actual time it took Polaroid to assemble each camera, information obtained directly from Polaroid records, Mr. Zaffino determined the number of cameras Polaroid would have been able to manufacture each month and identified the particular resource that would [*177] have constrained production in any given month. Under each scenario, Mr. Zaffino concluded that Polaroid would not have been able to manufacture enough cameras to meet total incremental demand in 1976-1979 and 1981, but would have been able to do so in every other year of the infringement period.

Mr. Zaffino's analysis is simple, thorough, and sound. His model closely tracked Polaroid's actual production. (DF 61,229). The analysis accurately reflects manufacturing realities by using reasonable lead times and actual efficiency rates. When in doubt, the model incorporates assumptions that favor Polaroid. Unfortunately, Mr. Zaffino based his models on demand levels contrary to my findings and did not perform an in-place analysis or a 100% demand scenario.

Conclusion

1976. The portion of Mr. Fortner's opinion concerning the eight-month advance scenario incorporates in-

formation about Polaroid's capacity most similar to the facts as I have found them. Even in that scenario, however, Polaroid would be unable to increase camera manufacturing capacity in 1976. (PT 2236B). Therefore, the Court is left with an in-place capacity analysis which concludes that Polaroid could have [*178] manufactured 256,000 cameras more in that year. Of course, as I discussed above, I find that testimony unreliable because it overstates efficiency and eliminates seasonalization. Under Kodak's fifty percent scenario, Mr. Zaffino concludes that Polaroid could have manufactured 85,000 more cameras in that year. Left with no other alternative, I believe the best approach is to choose the middle ground between these witnesses. This approach compensates for the flawed assumptions on both sides. Therefore, I find that Polaroid could have manufactured 170,500 additional cameras in 1976.

1977-1980: The effect of film production constraints on camera manufacturing. As a matter of policy, Polaroid, like Kodak, sold only as many cameras as it believed it would have the film to support. For instance, because of film manufacturing limitations, Mr. McCune decided in the fall of 1978 to limit the number of cameras Polaroid offered for sale in both 1978 and 1979. (TR 249-50; 494-97). On October 10, 1978, Mr. McCune reported to the Polaroid Board of Directors that: "We will have to limit the number of cameras we sell this year because we cannot make enough film to keep up with projected demand. [*179] " (PT 2078). Similarly, Mr. Booth wrote to Mr. McCune on November 1, 1978 that "we should control the number of cameras we sell in 1979 in a manner similar to the way it has been done this year." (PT 2079).

I have found that Polaroid would have been significantly limited in its ability to produce more film from 1977 to 1980. Accordingly, the company would have limited the number of cameras it manufactured and sold. By using a conservative film "burn rate" -- that is, the amount of film used by each camera every year -- and not including the film that would be required by cameras sold in other years, Mr. Zaffino calculated that Polaroid would have limited cameras sales so that at least six packs of film were available for each camera produced in a given year. I adopt his findings. The burn rate constrains sales to a greater degree than any independent manufacturing constraint in either party's analysis. I find that Polaroid would have manufactured the following number of additional cameras in the following years:

1977	928,500 cameras
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1978	8,166 cameras
1979	247,666 cameras
1980	129,166 cameras

1981-1985. If I was required to find Polaroid's [*180] precise camera manufacturing capacity in these years, I would be seriously taxed: neither proffered analysis is correct or helpful. With one summary calculation carried forward for every year after 1980, Mr. Fortner concluded that Polaroid's in-place capability was sufficient to meet combined demand. According to Mr. Zaffino, however, Polaroid would fall short in 1981 no matter what the demand, due to problems with the Sun introduction. I do not find his analysis persuasive. In every Kodak demand scenario, Polaroid is able to meet the reduced demand for cameras from 1982 to 1985. I cannot ferret out exactly how demand affects Mr. Zaffino's calculations in those years. It may be that he believes that by 1982, Polaroid would be able to keep up with whatever additional demand it faced.

Fortunately, a precise resolution of this problem is not necessary. According to my findings, Polaroid would not have made a profit on additional camera sales after 1979. (See Parts V and VI). In order to comply with the statute, I must award Polaroid a reasonable royalty on those sales. (See Part VII). Therefore, Polaroid's manufacturing capability in these years is irrelevant to lost profits [*181] on cameras. It would only be significant if the constraints were such that film sales, which remain in the black throughout the infringement period, would be affected. Generally, I find that Polaroid could have manufactured most of the cameras. Enough time has elapsed that Polaroid could have increased tooling, developed other suppliers, and hired sufficient people to meet the demand.

V. COSTS

Legal Principles

Factual Findings and Conclusions

A. Camera Manufacturing Costs

Variability of Payroll and Overhead

Exclusions Certain Classification Problems

Special Costs

Conclusion

B. Film Manufacturing Costs

Conclusion

C. Non-Manufacturing Costs

SADA and MRE&A Costs

Profit Sharing

Income Taxes

Legal Principles

The lost profits calculation determines "the difference between [the patent holder's] pecuniary condition after the infringement, and what his condition would have been if the infringement had not occurred." [Aro Mfg. Co., 377 U.S. at 507](#) (quoting [Yale Lock Mfg. Co. v. Sargent, 117 U.S. 536, 552 \(1886\)](#)). [*182] Once the issues of demand and capability are settled, one common method for determining lost profits is the incremental income method.

The incremental income approach recognizes that typically, the cost of producing additional units of the patented product is not as great as the cost of producing the first. [Paper Converting Mach. Co., 745 F.2d at 22](#). This approach separates the costs the patent owner historically incurred into fixed and variable components. Generally, the patent owner would incur the variable costs in producing additional volume but, unless new investment is required, would not incur those costs which are fixed and already paid. Id. Incremental costs are subtracted from incremental revenue in order to determine lost profits. The incremental income method for determining the cost of making the infringer's sales has been widely used in determining patent infringement damages. See, e.g., [State Indus., 883 F.2d at 1579-80](#); [Lam, Inc., 718 F.2d at 1059](#).

The parties agree that this approach is appropriate for the bulk [*183] of this case. Both parties also acknowledge that some additional investment would be required and accounted for these costs separately as "scale-up" or "special" costs.

Factual Findings and Conclusions

A. Camera Manufacturing Costs

Polaroid and Kodak agree that material costs, duty, and warranty are entirely variable parts of camera costs, but they disagree about the variability of payroll and overhead costs. They also disagree about whether some costs that Polaroid excluded from its analysis, such as research and development expenditures and certain period costs, should have been included and their variability assessed. There is also confusion about how Polaroid accounted for some costs: Polaroid included duty in its non-manufacturing costs estimate instead of the "cost of sales" portion; Polaroid's analysis of camera manufacturing costs may or may not have included warranty. Finally, while Kodak claims that Polaroid completely excluded packaging variability costs from both camera and film costs, Polaroid claims these costs were included.

Variability of Payroll and Overhead. Mr. McNamara was Polaroid's expert on costs. Mr. McNamara and his team from Arthur [*184] Young analyzed the fixed and variable portions of Polaroid's payroll and overhead costs in a sample year, 1985, by using the account analysis method. This method involves examining accounts at the general ledger level and determining whether that cost is fixed or variable. Polaroid personnel assisted the McNamara team with some of this analysis. After determining that the cost elements and the ratio of each element to total spending in both 1976 and 1981 were similar to 1985, the team felt confident using their 1985 analysis to predict what costs would increase with volume in each year from 1976 to 1985.

Mr. Kenneth Stringer, a retired partner of the accounting firm of Deloitte Haskins and Sells, presented Kodak's analysis of manufacturing costs. Mr. Stringer analyzed the variability of Polaroid's payroll and overhead costs by the historical method, which operates by plotting costs against volume and estimating the relationship. Mr. Stringer performed a "high/low" estimate, which compared the cost/volume ratio at the points of highest and lowest volume in a certain time period. He also performed a regression analysis to estimate the cost/volume relationship. As in Professor Fisher's [*185] and Professor Baumol's models, regression is a statistical technique for determining the relationship between two variables. Mr. Stringer presented ten different regressions based on different types of cost and volume data. Mr. Stringer's results were substantiated by contemporaneous Polaroid documents that used similar analyses or reach similar results. (DF 35,327; DF 25,570; DF 61,242).

I find Mr. Stringer's analysis much more accurate, credible, and appropriate than Mr. McNamara's analysis. First, I do not believe account analysis is the best method for cost accounting in these circumstances. The method, by definition, depends on subjective assessments by parties or experts, and this leaves it open to considerable

bias. Mr. McNamara's conclusion can be no better than the hundreds of individual decisions his team made when classifying costs. Of course, everyone on his team and all those at Polaroid who helped them, knew that this study was being done for this litigation. More importantly, the Court cannot judge the objectivity of Mr. McNamara's analysis because it is totally lacking documentation. Mr. McNamara submitted no work papers or notes of any kind and did not even list [*186] the Polaroid personnel he consulted. (TR 3861-62; TR 10637; DF 61,458R). On cross-examination, when the results of his analysis were questioned because of internal inconsistencies, Mr. McNamara was unable to articulate the reasons for his team's conclusions. (See, e.g., TR 3582-90). This problem was exacerbated by the fact that Polaroid only performed a full analysis for one year. For these reasons, I simply cannot rely on Mr. McNamara's conclusions.

On cross examination, Kodak pointed out several other problems with Mr. McNamara's work. He misapplied the payroll and overhead percentages from the account analysis to the standard costs used in computing the bottom line estimates. For instance, the engineering department payroll appears as "payroll" in the general ledger but is called "overhead" in the standard costs. (DF 61,458A, Tab 17). This misapplication reduced Mr. McNamara's estimate of variable payroll and overhead costs.

Applying variability percentages based on 1985 general ledger data to standard payroll and overhead costs created another problem: the general ledger included costs that are not included in "standard costs," such as period costs, development costs, and [*187] costs relating to products other than non-folding integral cameras. As a result, Mr. McNamara leaves the gate with a variability percentage of less than 100% before he even begins to analyze the costs that comprise non-folding camera standard costs. The denominator of the fraction contains costs that Mr. McNamara excluded from the numerator. The most obvious examples of this denominator problem were certain project materials and labor costs relating to the development of the Spectra camera that were included in the denominator but do not appear in the numerator.

Mr. Stringer's analysis more objective and accurate. Historical data are objective facts; estimates based on the historical relationships between cost and volume are therefore much less subject to the bias of the estimator. The only significant criticism of the regression technique -- which may affect Mr. Stringer's analysis -- brought to my attention is that the regression may capture the effect of an unidentified variable operating during the same time period. Because I am interested in determining how Polaroid could have performed in the past, any historical factor, so long as it is unrelated to Kodak's entry, is ap-

propriately [*188] included. Moreover, if, as Mr. McNamara claims (PT-2367 at 17,32), Polaroid's manufacturing processes did not change significantly during the period 1976-1985, there is even more reason to look to historical trends in volumes and costs.

Exclusions. Mr. McNamara excluded period costs and certain other costs from his variability analysis because he determined that these costs did not relate directly to manufacturing and because they were generally discretionary in nature. Examples of excluded period costs are capital write-offs, excess tooling, idle space and equipment, non-product payroll, and moving expenses. Certain development costs were also excluded because they did not relate to integral instant products or because they were non-recurring. Examples of excluded development costs are the costs for diversified product development, integral instant product inception, and Ireland start-up. Mr. McNamara concluded that these costs would not have increased (and in fact, may have decreased) with the manufacture of additional integral instant cameras and film.

Mr. Stringer analyzed these exclusions and determined that they were fifty percent variable. He agreed that the development [*189] costs were properly excluded but thought that some of the period costs, such as the cost of producing replacement parts for obsolete camera models that had been altered or taken out of production, would increase with volume.

In this matter, I credit Mr. McNamara's conclusions because they are soundly reasoned and supported. Other than his belief that some of the costs would vary, Mr. Stringer did not offer any support for his determination that the costs would be fifty percent variable.

I return now to the parties' dispute about whether Polaroid included packaging variability costs in its analysis. "Packaging variability" covers material costs, greater or less than anticipated in the standard cost, that result from selling camera units as kits or in different packaging configurations. Historically, it was accounted for in Polaroid's "cost of sales." Mr. McNamara claimed, however, that since the costs related to packaging changes requested for marketing purposes, they were included in his analysis of selling, advertising, distribution, and administrative ("SADA") costs. Kodak claims that Polaroid omitted it entirely from its analysis.

Considering all the evidence on this point [*190] (e.g., TR 11074; 3413-14), I find that Polaroid did omit these costs. I credit Mr. Stringer's opinion that these costs were 100% variable and should have been included in Polaroid's incremental cost.

Certain Classification Problems. Mr. McNamara and Mr. Stringer agreed that duty and warranty are en-

tirely variable costs. (TR 3127; 3411-12; DF 10,741). Polaroid included duty costs in its SADA category even though it was historically included in the "cost of sales." Manufacturing costs plus duty and warranty are typically referred to as "cost of sales." This is what most executives think of as manufacturing costs although it does include some costs incurred outside the factory. Because I have adopted the portion of Kodak's analysis that includes duty, I will not double-count it in non-manufacturing costs.

The question of warranty costs is more significant. During its cross-examination of Mr. Stringer, Polaroid suggested that domestic warranty costs were included in Mr. McNamara's payroll and overhead costs (TR 10843-50), a possibility Mr. Stringer noted in his report and in his testimony. Mr. McNamara stated in his report (PT 2367 at 38), support papers (DF 61,743) and testimony [*191] (TR 3124-25; 3410), however, that he transferred warranty costs from manufacturing costs to corporate overhead. Mr. Stringer included an additional amount for all warranty costs but acknowledged that if Mr. McNamara did not remove domestic warranty costs from his payroll and overhead totals, the additional cost should be reduced by sixty cents.

Polaroid's post-trial brief again argues that at least sixty cents of the warranty cost was included in Mr. McNamara's analysis and is therefore double-counted in Kodak's analysis. Given the almost universal confusion on this matter, I am giving Polaroid the benefit of the doubt and have reduced Mr. Stringer's estimate by sixty cents (which leaves an additional fifty-five cents for international warranty costs).

Special Costs. Both parties recognized that Polaroid would incur certain additional investment costs if attempting to meet the combined demand. Mr. McNamara's "scale-up" costs averaged twenty-eight cents per camera (PT 2367A, Tab 3) and Mr. Stringer's "special" costs averaged fifteen cents per camera. (DF 61,458R, Tab 14). Mr. Stringer used Mr. Zaffino's fifty percent scenario capital costs for his 100% or "Panduit" scenario [*192] cost estimates but acknowledged that this figure underestimated the investment required. (TR 10665). Despite Kodak's suggestion in its post-trial brief that the special costs should be doubled for the 100% scenario, Mr. Stringer did not testify to that and the capital investment under the fifty percent scenario is the cost estimate most consistent with my findings about what Polaroid would have done to meet the combined demand. (See Part IV). Therefore, I have used the special costs Mr. Stringer included in his 50% estimate.

Conclusion

I find that the incremental cost per camera that Polaroid would have incurred is best approximated by Mr. Stringer's year-by-year costs in Tab 14 of DF 61,458A, minus 4.4%. The 4.4% represents the percentage reduction when sixty cents in warranty and sixty-one cents for excluded costs are subtracted from his overall average cost estimate of \$ 27.64 per camera.

B. Film Manufacturing Costs

My discussion of camera manufacturing costs also applies to film manufacturing costs. Overall, I find that Mr. Stringer's analysis is more objective and reliable. I find that he properly included packaging variability but improperly included fifty percent [*193] of period costs.

Unlike camera costs, there is no dispute that Mr. McNamara excluded warranty costs in his manufacturing cost estimate for film. Mr. Stringer appropriately added this variable cost to his estimate. Duty costs which Polaroid accounted for in non-manufacturing costs were also correctly added to his estimate.

I have found that Polaroid would have needed and would have invested substantial additional capital in its film manufacturing operation in order to meet the combined demand. If the costs for constructing additional negative and positive sheet coating and film assembly machines are added to Mr. Stringer's fifty percent capital costs scenario, these costs total approximately fifty cents per film pack.

Conclusion

I find that the incremental cost per film pack that Polaroid would have incurred is best approximated by Mr. Stringer's year-by-year cost estimates found at Tab 25 of DF 61,458A, plus 9.5%. The additional 9.5% represents the percentage increase when two cents in improper exclusions are subtracted and an additional twenty-eight cents in special costs (twenty-two cents are already included) are added to his average cost estimate of \$ 2.74 per film pack.

[*194] C. Non-Manufacturing Costs

Non-manufacturing costs consist of marketing, general and administrative, and research and development costs. Polaroid also included duty and warranty in this category although those costs are typically included in "cost of sales" figures. Kodak claims that profit sharing and income taxes must also be accounted for in this category but Polaroid objects to their inclusion on legal grounds.

Because I have already included duty and warranty in manufacturing costs in the previous section, I will not consider them now. I will consider profit sharing and

income taxes separately. First, I will discuss the majority of these costs, termed selling, advertising, distribution, and administrative ("SADA") costs by Polaroid and marketing, research, engineering and administrative ("MRE&A") costs by Kodak.

SADA and MRE&A Costs. Polaroid historically spent about thirty percent of sales revenue on overhead costs, minus research and development costs. Mr. McNamara concluded that Polaroid's historical SADA costs for instant photography products were 31.02% of domestic sales and 30.65% of international sales. Kodak concluded that Polaroid's historical MRE&A cost [*195] worldwide was 38.3% of sales, but Kodak included research and development costs (8.6% of sales), which Mr. McNamara excluded. Mr. McNamara also included "other marketing costs" (which included duty and some warranty and amounted .99% of domestic sales and 1.68% of international sales) which Kodak treated as part of "cost of sales." Adjusting the relative amounts of those costs produces SADA/MRE&A estimates of close to thirty percent of sales revenue.

Mr. McNamara and his team performed an incremental cost analysis for SADA/MRE&A costs similar to the one they performed for manufacturing costs. Based on their review of Polaroid's 1985 general ledger accounts and consultations with Polaroid personnel, the McNamara team predicted how increased volume would have affected costs. As they did with manufacturing costs, the team compared the elements of costs and the relationship of those costs to total spending in two other years, 1976 and 1981. Again finding similar results, the team applied the 1985 percentages to each year of the infringement period. The McNamara team concluded that, in connection with incremental sales, Polaroid would have incurred incremental SADA costs at 12.98% of net [*196] revenue for domestic sales, and 16.72% for international sales. Polaroid treated research and development costs as fixed.

Kodak's analysis of Polaroid's marketing and other non-manufacturing costs was presented by Professor Robert N. Anthony. Professor Anthony has taught and written extensively on management control of costs. He has been responsible for cost control as a director of two large public corporations as a trustee of the Dartmouth-Hitchcock Medical Center and Colby College. Professor Anthony also served as Assistant Secretary of Defense from 1965 to 1968, with responsibilities for a considerable budget. Professor Anthony studied Polaroid management's goals and performance in controlling non-manufacturing spending by examining contemporaneous documents, trial and deposition testimony, and Polaroid's financial records for 1976-1985. It was his conservative estimate that Polaroid's incremental non-manufacturing

expenses would have equalled thirty percent of incremental revenues.

Professor Anthony concluded that because Polaroid management projected devoting thirty percent of sales revenue to MRE&A and looked at MRE&A in total, they could not have budgeted less on incremental [*197] volume. The projected goal is well substantiated in the record (see, e.g., PT 2272; DF 40,282; DF 35,317), although Polaroid was often unable to meet it. After 1979, when actual revenue was lower than planned, the overhead percentage was higher because Polaroid consistently overestimated revenue and overhead spending largely depends on estimated revenue. (TR 11785). After 1979, Polaroid revenues declined. Professor Anthony testified that when revenues decline it is more difficult to control expenses, a phenomenon known as "cost stickiness." (TR 11785). Because Polaroid would have faced the same revenue pattern even without Kodak, Professor Anthony believed that Polaroid could not have spent less in trying to meet the combined volume.

As is typical of this litigation, the parties disagree about how the legal standard should be applied to these facts. Polaroid argues that the only relevant costs are those that it necessarily would have incurred. Mr. McNamara excluded costs Polaroid could have chosen to forego. Kodak claims that Polaroid's revenues should be reduced by those costs it would have incurred (because of the "stickiness" of overhead and inaccurate forecasting and [*198] planning), whether those costs, in hindsight, really were necessary. As is also typical of this litigation, the difference amounts to little when the facts are examined.

It is not a matter of law whether the costs should be based on actual volume or whether projected volume and planning should be the basis; it is a matter of fact. The record is uncontroverted that overhead is a cost intimately related to planning, both at Polaroid and within other corporations. (TR 11778-79). Polaroid's overhead spending was tied not only to sales volume, but also to sales forecasts, and Polaroid's particular management style. Even after Kodak left the market, the ratio of incremental MRE&A to incremental revenues was thirty-eight percent. (DF 61,688A, Tab 33). Kodak's analysis, which closely examines the relationship between Polaroid's historical planning and overhead spending, is more compelling than Polaroid's, which disregards this relationship by looking, after the fact, at which costs might be fixed and which variable.

There are other problems with Mr. McNamara's analysis. I find the same problems here as in the team's analysis of manufacturing costs: for all SADA costs except media, sales [*199] promotion and transportation, the variability classifications are subjective and undocu-

mented. For example, in concluding that salesforce costs were only eleven percent variable, Mr. McNamara did not look at historical spending patterns (TR 3844) or salesforce levels (TR 3807), and did not read the depositions of Polaroid marketing personnel (TR 3799-800) or review contemporaneous documents (TR 3754; 3835-40). Mr. McNamara did not find it necessary to speak with either Polaroid's marketing controller or head of consumer marketing. (TR 3810). I cannot rely on what appear to be, in the face of considerable contrary evidence, clearly arbitrary decisions.

Nor can I fully adopt Professor Anthony's analysis. His estimate included research and development costs because he discovered that a significant portion of engineering and some research expenses supported Polaroid's ongoing business rather than new product development. He concluded, therefore, that research and engineering expenses would have increased at the same rate -- 8.6% of sales revenue -- as they did historically. Yet, he acknowledged that forty percent of the 8.6% would have been spent on new product development. By definition, [*200] these costs are fixed and already paid. Polaroid had already spent all the money on developing new products it needed to meet the combined demand. Professor Anthony reduced the 38.3% historical MRE&A expenses to thirty percent, in part to take into consideration any benefit that Polaroid could have realized from new products. He does not concede that Polaroid would have avoided these expenses.

Professor Anthony's reduction from 38.3% to thirty percent appears both confusing and arbitrary. I am not sure exactly what the reduction excludes. Because I find that research and engineering costs for new products are costs that would not have increased with additional volume, I must reduce his figure. I find that Polaroid would have spent twenty-eight percent of sales revenue on MRE&A costs. The two percent reduction reflects my conviction that Professor Anthony's basic analysis is accurate but that certain research and development costs should be excluded. It also reflects my belief that Polaroid could have achieved some small savings in overhead on these incremental sales.

Profit Sharing. Kodak argues that the monies Polaroid would have had to pay to its employees under its profit [*201] sharing plans should be deducted as costs from its profit. As benefits to its employees, Polaroid offered the Polaroid Incentive Compensation Plan and the Profit-Sharing Retirement Plan. (DF 13,322A). These plans called for payments equal to fifteen percent of Polaroid's profits before taxes and profit sharing, after a deduction of an amount equal to ten percent of shareholder's equity.

There is no question that if Polaroid had made additional qualifying profits, it would have paid the amounts due under the profit sharing plans. However, I am unable to determine that amount without engaging in improper speculation. Not only would the profit sharing amount be subject to change (and did change during the infringement period), the amount of capital available for profit sharing depends upon the amount Polaroid paid its shareholders in dividends from year to year. Professor Anthony admitted that he had no way of determining whether or how Polaroid might have changed its dividend or profit sharing formulas if it had actually received additional profits during the infringement period. (TR 12057-60). All doubts in this matter must be resolved against the infringer. [Lam, Inc., 718 F.2d at 1065](#); [*202] [Story Parchment Co., 282 U.S. at 563](#).

Moreover, even if I had a sound basis for applying the profit-sharing plans to Polaroid's additional profits, I could not do so. The plans themselves were not admitted into evidence and although the basic formula for profit sharing is quite simple, with no evidence the Court cannot discern the appropriate amounts of the variables. On the record before me, for example, I cannot determine the amount of shareholder's equity in the "but for" Kodak world.

Income Taxes. The issue of whether Polaroid's profits and royalties should be reduced by the amount of taxes the company would have paid in each year is most crucial to the interest calculation. Therefore, I discuss it in Section X.

VI. LOST PROFITS CALCULATION

Incremental Camera Revenue

Polaroid would have obtained the revenue on each camera unit sold by Kodak constrained only by its marketing and manufacturing capacities. Considering the largest constraint on its ability to make sales in each year, Polaroid would have been able to make the camera sales listed in Appendix I. In 1976, the limiting constraints were marketing factors: lost sales in Latin America [*203] and South Africa. From 1977 to 1980, the most significant constraint was Polaroid's film manufacturing capacity. From 1981 to 1983, Polaroid's lost sales resulted from its limited success in the premium channel, the Middle East, Latin America, and South Africa. In 1984 and 1985, the same factors limited Polaroid's ability to make all of Kodak's sales, except that Polaroid was not limited in the premium channel.

Polaroid is entitled to the incremental revenue it would have obtained on these, minus the costs. Two methods were presented at trial for determining the amount of revenue Polaroid would have received. Both

methods attempted to "translate" Kodak sales into Polaroid sales. In other words, because Polaroid did not sell the same camera models as Kodak, the parties determined what equivalent Polaroid models Kodak buyers would have purchased but for the infringement.

Professor Buzzell presented a detailed model-by-model translation for Kodak. (DF 61,091). This allowed the Court to translate all of the sales and arrive at a weighted average revenue per camera Polaroid would have received in each year.³⁴ Testifying for Polaroid, Mr. McNamara grouped Kodak cameras into two groups: [*204] low- and medium-range. He arrived at a Polaroid average revenue in each year for each of these categories by weighting the revenues according to the traditional mix of low- and medium-priced cameras Polaroid actually sold. Mr. McNamara then multiplied that revenue by the corresponding numbers of low- and medium-range cameras Kodak actually sold.

34 I found it necessary to slightly adjust Professor Buzzell's translation in a few instances to take into account international models and to rectify what I judge to be considerable price differences between "matching" models. In the case of international models, I used his equivalents models at DF 61,005, p. 20. I adjusted his 80 (Pronto)/20 (Pronto RF) split of EK6 sales into a 50/50 split in 1977 and 1978. In 1978, I also adjusted his 85 (Pronto)/15 (Pronto RF) for the CB200 to a 60/40 split of the same models. In 1982, I changed his K970L classification to 100% Sun 650.

Kodak's method produced revenues for Polaroid considerably lower -- up to \$ 5 per camera in some [*205] years -- than the revenues Kodak actually realized on each camera. This is an unlikely and unfair result. Polaroid's method produced per camera revenues that were sometimes higher and sometimes lower than those produced by Kodak's method. Although Polaroid's method is preferable to Kodak's, I find Mr. McNamara's two-group classification overly simplistic. This method does not account for what consumers paid for Kodak cameras, and thus ignores evidence that price was a critical factor in consumer's purchase decisions. To give Polaroid the benefit of the doubt, I used whichever analysis yielded the greatest revenue. This method produced average per camera revenues that I found reasonable and consistent with the record as a whole. I then multiplied this number by the number of camera sales. Both calculations are reflected in Appendix I.

Incremental Camera Costs

The incremental costs Polaroid would have incurred on the additional camera sales were detailed in Section V. I subtracted both the incremental manufacturing costs

and the incremental non-manufacturing costs which were expressed as a percentage of revenue. They are also listed in Appendix I.

Lost Profits on Cameras

[*206] Polaroid could have realized a profit on additional camera sales in the years 1976-1979. The overall margin and total profit appear in Appendix I. From 1980 onward, Polaroid would have lost money. This pattern is consistent with the general historical pattern of profit and loss. Because I have found that Kodak's entry into the market did not cause any price erosion, it is not surprising that incremental sales would become unprofitable at about the same time they did historically. The margins roughly follow the historical pattern of OneStep margins and the pattern in Professor Anthony's report. (DF 61,688, Tab 1).

Although Polaroid earned a slight profit in 1979, its profit is below what I have found to be reasonable royalty in this case. (See Section VII). Pursuant to [35 U.S.C. § 284](#), I have awarded Polaroid a reasonable royalty on all Kodak's camera sales in 1979-1985.

Incremental Film Revenues

Polaroid is entitled to lost profits on those film sales it would have made in Kodak's absence. The factors which would have affected film sales were Polaroid's ability to manufacture film and the effect of lost camera sales on film sales. To arrive at the [*207] number of film sales Polaroid would have lost in each year from each lost camera sale in that same year, I subtracted a "burn rate" of fifteen packs per camera. (TR 2626). Inevitably, this leads to some inaccuracies because not all of packs would have been bought in the year the camera was purchased. Therefore, in the early years, the burn rate overestimates lost film sales and in the later years, it underestimates them. I have also considered evidence that some camera sales, such as the premium cameras,

would not "burn" as much. The difference is insignificant. On average, I believe that the number is fair.

The incremental film sales are set forth in Appendix II. In 1976, film sales were lost due only to marketing factors. In 1977-1980, film sales were constrained by Polaroid's ability to manufacture film. From 1981 to 1985, only Polaroid's marketing capabilities constrained film sales.

The average revenue per film pack is simple to determine because Kodak and Polaroid film was priced essentially the same throughout the infringement period. The film revenue per pack contained in Appendix II is taken from Mr. McNamara's report. (PT 2367, Tab 3). Revenue per pack was multiplied by [*208] the number of incremental sales to arrive at incremental revenue.

Incremental Film Costs

Incremental costs were detailed in Section V. Incremental manufacturing costs were subtracted from incremental revenues and non-manufacturing costs were calculated as a percentage of revenue.

Lost Profits on Film

Polaroid is entitled to lost profits on film in every year of the infringement period. The profit margins are not as high as Polaroid achieved during the pack era but the nature of the market and Polaroid's operations had changed significantly. As best I can judge from the evidence presented, these profit margins are roughly consistent with what Polaroid earned during the infringement period. Overall, I find these incremental profits consistent and reflective of the record as a whole. They are detailed in Appendix II.

Total Lost Profits

Polaroid's lost profits for camera and film resulting from Kodak's infringement are as follows:

Year	Profit
1976	\$ 4,590,233
1977	\$ 10,407,946
1978	\$ 110,284
1979	\$ 1,839,817
1980	\$ 838,744
1981	\$ 46,268,909
1982	\$ 52,123,323
1983	\$ 48,391,091
1984	\$ 51,376,537
1985	\$ 17,118,547

Total	\$ 233,055,432
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[*209] VII. REASONABLE ROYALTY

Legal Principles

In Section V, I concluded that Polaroid proved lost profits in connection with some, but not all of the infringing sales. The patentee can prove its damages by showing lost profits on infringing sales, or if lost profits are inadequate or cannot be proved, by a reasonable royalty. Panduit Corp. v. Stahl Bros. Fibre Works, Inc., 575 F.2d 1152, 1157 (6th Cir. 1978); 35 U.S.C. § 284. The Federal Circuit has stated that "[a] reasonable royalty . . . is . . . the floor below which damages shall not fall." Stickle v. Heublein, Inc., 716 F.2d 1550, 1561 (Fed. Cir. 1983) (quoting Bandaq Inc. v. General Tire Co., 704 F.2d 1578, 1583 (Fed. Cir. 1983)). To make Polaroid whole, as directed by section 284, in addition to lost profits Polaroid is entitled to a reasonable royalty on further types of Kodak sales: those infringing sales for which Polaroid would have realized little or no profit and those infringing sales that Polaroid would not have been able [*210] to make because of limits in its manufacturing and marketing capabilities. A combined award is justified where the lost profits alone do not account for all of the infringing sales. See Gyromat Corp. v. Champion Spark Plug Co., 735 F.2d 549, 551 (Fed. Cir. 1984) (affirming a combined lost profits/reasonable royalty award determined by a master); Bio-Rad Laboratories, Inc. v. Nicolet Instrument Corp., 739 F.2d 604, 615-16 (Fed. Cir. 1984) (affirming combined lost profits/reasonable royalty damages awarded by a jury); TWM Mfg. Co. v. Dura Corp., 789 F.2d 895, 898 (Fed. Cir. 1986) (affirming a master's award that included lost profits for certain years and a reasonable royalty for others); Radio Steel & Mfg. Co. v. MTD Products, Inc., 788 F.2d 1554, 1555 (Fed. Cir. 1986) (affirming a combined lost profits/reasonable royalty award); Amstar Corp. v. Envirotech Corp., 823 F.2d 1538 (Fed. Cir. 1987) (affirming an award of damages based on lost profits for some sales and a reasonable royalty for others).

[*211] There are two generally accepted approaches to the determination of a reasonable royalty. The first requires an analysis of evidence bearing on Kodak's entry into the market, including its own internal profit projections. This approach is a straightforward examination of the infringer's motives as evidenced by its own documents and testimony. TWM Mfg. Co., supra. A second approach is the construction of a hypothetical negotiation between a willing licensor and will-

ing licensee. Certain factors that may be considered in this method are set forth in Georgia-Pacific Corp. v. United States Plywood Corp., 318 F. Supp. 1116 (D.N.Y. 1970), modified and aff'd, 446 F.2d 295 (2d Cir.), cert. denied, 404 U.S. 870 (1971). Those factors are refined somewhat and the proposed analytical process of reaching a reasonable royalty are addressed in a more realistic fashion in Panduit, 575 F.2d at 1158, 1164. This Court is not the first to find the task of determining a reasonable royalty difficult:

Determining a fair and reasonable royalty is often, as it was here, a difficult judicial chore, seeming often [*212] to involve more the talents of a conjurer than those of a judge.

Fromson v. Western Litho & Supply Co., 853 F.2d 1568, 1575 (Fed. Cir. 1988).

Whatever method is adopted, the objective is the same -- to provide adequate compensation for the infringement. "Thus, the calculation is not a mere academic exercise in setting some percentage figure as a 'royalty'. The determination remains one of damages to the injured party." Fromson, 853 F.2d at 1574 (emphasis original); TWM Mfg. Co., 789 F.2d at 899.

Findings and Conclusions

On the issue of reasonable royalty, like every issue in this case, competing experts were pitted against each other. Polaroid's expert, Professor Fisher, testified that, after considering the significance and duration of the patents in suit, the lack of an acceptable non-infringing substitute, Polaroid's policy of not licensing, and its forecasts for the profitability of the SX-70 system, Polaroid would not have licensed Kodak except at a royalty rate of 72.5% for cameras and 63.4% for film. Professor Fisher concluded that these numbers "would have been far greater than the royalty rates Kodak [*213] would have been willing to pay." (TR 5330-31). Kodak's expert, Paul Wylie, testified that the parties, at a hypothetical negotiation, would have agreed on a non-exclusive royalty rate of five percent. These negotiations would have been based on the anticipated profits projected in a February 27, 1976 Kodak forecast. (DF 61,724).

Resolving such glaring conflicts between experts is not new in this case. Here, as in earlier instances, I have assessed the credibility of the witnesses and reviewed the factual underpinnings that are relevant to this issue and reached my independent judgment of a reasonable roy-

alty. In general, despite his credentials, I have rejected Professor Fisher's proposed royalty rates as unsupported by the historical context of this case, unlikely in light of the parties' long-standing relationship and simply unrealistic in light of its effect on Kodak's potential earnings as well as its effect on Polaroid's profits over the period involved. While he presented various scenarios, the one urged by Polaroid in post-trial submissions, a 72.5% royalty rate on cameras and a 63.4% royalty rate on film, would have required Kodak, even at its rosier projection, to operate [*214] an all-out effort in order to achieve a disastrous loss. Even his more modest constructs resulted in great losses, although, as Professor Fisher described it, at an "accounting profit." The same figures would exceed pre-tax earnings in every year of the infringement period and would have elevated Polaroid to the pinnacle of successful American corporations.

While I do not accept his bottom line, I found Mr. Wylie's presentation to be more sound and his analysis better reasoned, supported by relevant precedent, and more closely aligned with the facts. I also found his experience, training, and education as a patent examiner, an attorney, and teacher in the field of patent licensing to be superior to that of Professor Fisher. The royalty rate of five percent that Mr. Wylie proposes would have provided Polaroid with thirty-three percent of Kodak's profits as projected in February 1976, shortly before Kodak's entry. This rate would have provided Polaroid with an 18.9% return on the sales it expected to lose to Kodak, almost twice as much as Polaroid earned in the years 1972-1975 when it faced no competition from any source. Polaroid had projected, if alone in the market, a return [*215] of fourteen percent, but between 1986 and 1988, after Kodak left the field, its return was only one percent. A five percent royalty would have been acceptable to Polaroid even knowing its patents were infringed, because it provided Polaroid with a higher financial return than it could reasonably have expected on its own sales and would have done so on a risk-free basis.

Against this backdrop, I conclude a reasonable royalty rate is achieved under either the TWM Mfg. Co. or Georgia-Pacific Corp. approach.

1. The Analytical Approach

In February 1976, Kodak projected operating gross profits of \$ 611,594,000 on projected revenues of \$ 3,775,784,000. The gross profits included the costs Kodak incurred from 1970-1975. (DF-61,724). This ongoing study was the final and most reliable projection before April 1976, the date of Kodak's entry. It was the result of continuing drastic reductions in profitability projections from December 1970 when Kodak had projected revenues of \$ 6.3 billion and gross profits of \$ 4.5 billion. Using this approach, Mr. Wylie testified that, in

his experience, a royalty rate that provides the patent holder with one-quarter to one-third of the licensee's [*216] anticipated process is fair. Mr. Wylie's approach results in a royalty rate of between four percent and 5.3%.

Using an earlier Kodak profit projection from November 1975 -- with its higher estimates of anticipated profits -- excluding costs incurred before 1976, and computed based on 100% of anticipated profits, Polaroid calculated a royalty rate of 27.6% of Kodak net sales revenues. Had Polaroid used the later February 1976, and, I believe, more accurate and reliable projection of profitability, and calculated based on 100% of operation profits, the royalty rate would be about 16.2%.

2. The willingly negotiated royalty rate.

I approach this method with the comforting reminder of Chief Judge Markey:

The methodology encompasses fantasy and flexibility; fantasy because it requires a court to imagine what warring parties would have agreed to as willing negotiators; flexibility because it speaks of negotiations as of the time infringement began, yet permits and often requires a court to look to events and facts that occurred thereafter and that could not have been known to or predicted by the hypothesized negotiators.

[Fromson, 853 F.2d at 1575](#). I am [*217] mindful that it is unrealistic to consider the parties as truly "willing" participants. In these hypothetical negotiations, we must consider the patents valid and infringed and that the parties were fully informed as to this fact. [Panduit, 575 F.2d at 1158-59](#). With the assurance that some element of uncertainty will exist, but having in mind that the royalty arrived at must be "reasonable" under the circumstances, I turn to what I believe are the controlling facts on this issue.

First, I do not accept Polaroid's assertion that the parties would not have negotiated a license under any circumstances. Their history reflects a long standing policy to share technological advances, to supply materials to each other, and to license processes and products. I believe the record is clear that, prior to this lawsuit, the parties, especially Dr. Land, demonstrated mutual respect and recognition of each other's accomplishments and abilities. There was much to negotiate. In his testimony, Mr. McCune stated that Kodak would not commit to supply Polaroid with color negative for instant film unless a license were granted. This arrangement would have benefitted Polaroid. The question [*218] is not whether Polaroid would have licensed Kodak; the question is at what price would Polaroid have licensed Kodak. The highest rate of all licenses negotiated between

the parties was 2.5%; the average was 1.7%. For its successful 110 and 126 Instamatic camera and film, and its Disc photography, Kodak negotiated a royalty rate of two percent or less. Similarly, Polaroid's licenses averaged 4.9%. Mr. Chandler testified that five percent was the highest rate he would have accepted.

Second, while the issue of an acceptable non-infringing substitute has been laid to rest, I believe the record shows convincingly that Kodak never envisioned instant photography as a replacement for conventional photography. This was a vision devoutly believed and expressed by Polaroid executives, particularly Dr. Land and Dr. Young. Instant photography was not essential to Kodak's continued presence in the photography market. At most, instant merely supplemented Kodak's conventional photography business, a welcome development owed to Kodak's stockholders, a necessary component of Kodak's reputation as a dominant figure in all phases of the photography industry. The later revenues and profits projected [*219] by Kodak constituted only a minor percentage of its overall business. Instant photography would not have promoted the sale of Kodak's main products, conventional camera and film. See Deere & Co. v. International Harvester Co., 710 F.2d 1551, 1558-59 (Fed. Cir. 1983). In this time period, instant photography never accounted for more than eight percent of the entire-picture taking industry and not more than three percent of Kodak's sales. It was in a sense a competing product, but not a threat to Kodak's future. Mr. McCune testified that the problem was whether Polaroid could survive with Kodak in the market. The record persuades me that Polaroid would have survived and prospered with Kodak in the market at a reasonable royalty rate which provided Polaroid with a substantial share of Kodak profits. I also note that in negotiating a license with Kodak, Polaroid was not precluded from negotiating with other manufacturers as well.

This section would not be complete without another reminder of the dismal failure of both parties to accurately project the future. Both sides seriously overestimated the demand for instant photography and the price the consumer was willing [*220] to pay for it. Both sides, Polaroid more grievously because of the single nature of its business, underestimated the impact of 35mm picture-taking and film developing.

Considering all the factors applicable to either approach, and taking into account all of the facts and circumstances, I conclude Polaroid and Kodak would have negotiated in good faith and, taking into account all of the information available to both sides, would have agreed upon a royalty of ten percent, or slightly more than sixty percent of Kodak's anticipated profits through 1986 on those sales of camera and film on which lost profits were not sufficient or could not be proved. I also

conclude that, independently of any negotiated royalty rate, and after an analysis of Kodak's February 1976 projections, a royalty rate of ten percent is fair compensation. In my judgment, under either approach a ten percent royalty rate will "adequately compensate" Polaroid under [section 284](#).

VIII. WILLFULNESS

This section address the question of whether Kodak willfully infringed the seven patents at issue, thus permitting "increased damages up to three times the amount found or assessed" above, pursuant to [35 U.S.C. § 284](#). [*221] The answer requires a patent-by-patent analysis in light of the applicable legal standards.

Legal Principles

The willfulness inquiry is, by necessity, a fact-sensitive one. Conduct clearly evidencing good faith and reasonableness in one context may fall far short in another; identical factors may be assigned substantially different weight depending on the totality of the circumstances. Radio Steel & Mfg. Co. v. MTD Products, Inc., 788 F.2d 1554, 1559 (Fed. Cir. 1986). One important factor courts consider is whether the infringer timely obtained, and took into account, the opinion of qualified patent counsel before taking the actions eventually found infringing. Rite-Hite Corp. v. Kelley Co., 819 F.2d 1120, 1125 (Fed. Cir. 1987). Simply obtaining an opinion of counsel, however, will not insulate the infringer. Machinery Corp. of America v. Gullfiber AB, 774 F.2d 467, 472 (Fed. Cir. 1985). Reliance on counsel's opinion must be reasonable in the circumstances. See Datascope Corp. v. SMEC Inc., 879 F.2d 820, 828 (Fed. Cir. 1989), [*222] cert. denied, 110 S. Ct. 729 (1990).

In order to recover punitive damages, the patentee shoulders a considerable burden. It must prove willful infringement by clear and convincing evidence. E.I. DuPont de Nemours & Co. v. Phillips Petroleum Co., 849 F.2d 1430, 1439-40 (Fed. Cir.), cert. denied, 109 S. Ct. 542 (1988). Ordinary patent suits can be hard-fought and involve close or novel questions about which reasonable minds, in good faith, may disagree. See Kloster Speedway AB v. Crucible Inc., 793 F.2d 1565, 1579 (Fed. Cir. 1986). What distinguishes willfulness is evidence that the infringer deliberately disregarded the patent or flagrantly disregarded the patent laws and had no reasonable basis for believing it had the right to act as it did. Stickle v. Heublein, Inc., 716 F.2d 1550, 1556 (Fed. Cir. 1983); Dickey-John Corp. v. International Tapetronics Corp., 710 F.2d 329, 349 (7th Cir. 1983).

The theme for Polaroid's willfulness charge is based on a single assertion. According [*223] to Polaroid, no skilled attorney would have advised Kodak that the pat-

ents in suit were invalid or not infringed by Kodak's instant film and cameras. In its turn, Kodak states that, as it developed its integral instant photography system, it repeatedly obtained validity and infringement opinions from Francis T. Carr, a leading national expert in patent clearance and unabashedly praised by Polaroid's counsel throughout the damages portion of the trial. Since Mr. Carr's advice to Kodak was so at odds with the advice Polaroid contends any skilled attorney would have rendered, Polaroid asks the Court to believe that Kodak somehow either manipulated Mr. Carr, or the information Carr received, in order to reach a result desired by Kodak, namely, various opinions of counsel that ratified and masked Kodak's willful infringement of Polaroid's patents. That dog will not hunt. Polaroid has failed to produce a single shred of evidence that supports this claim, as the following review of the record demonstrates.

Findings of Fact

Kodak retained Mr. Carr and his firm, Kenyon & Kenyon, at the inception of its instant integral photography program, seven years before producing its first commercial [*224] product. During the lengthy and detailed patent clearance process he performed for Kodak, Mr. Carr considered over 250 Polaroid and non-Polaroid patents and rendered 67 written and countless oral opinions on both the film and camera patents. A patent-by-patent analysis follows.

(a) The '821 Patent: Polymeric Acid Layer

The '821 patent had issued before Kodak launched its integral photography program and it was one of the first Mr. Carr considered. His analysis of the patent and Kodak's product spanned four years, included four written opinions, and demonstrates the exceptional care and skill Mr. Carr brought to the task.

The crux of the '821 patent, in Mr. Carr's opinion, was the location and function of the polymeric acid layer in the instant film unit. The Polaroid patent describes the acid layer as part of the "photosensitive element" in a peel-apart unit, where it functions to stop the development process and sufficiently reduce the alkali after development to prevent oxidation and give the final image bright and stable colors. In Kodak's PR-10 integral film unit, the acid layer is located on one of the film supports -- not, in Mr. Carr's analysis, part of the "photosensitive" [*225] element -- and the oxidation problem is avoided because the developer is not exposed to the air. Mr. Carr thus advised Kodak that its product did not infringe '821 and further advised that '821 was obvious in view of prior art.

Judge Zobel determined that '821 was valid and infringed by Kodak's PR-10 film unit, rejected obviousness

based on prior art, and observed that "conflicting definitions of 'photosensitive element' in other Polaroid patents do not save PR-10 from the claim of infringement." [641 F. Supp. at 838](#). Polaroid's expert, Professor Adelman, repeated this refrain throughout his testimony, asserting that any "skilled attorney" would interpret the phrase "photosensitive element" differently than Mr. Carr did, adding only that Mr. Carr's advice was wrong because Claim 1 of '821 describes a process, not a structure.

Probe though it did at trial, Polaroid could uncover no irregularities in Kodak's actions in obtaining Mr. Carr's opinion on '821, or in Mr. Carr's actions in formulating the advice he gave Kodak. Mr. Carr compared '821 to the prior art, reviewed the file wrapper and prosecution history, discussed the Kodak technology with Kodak engineers, and [*226] gave his considered advice, well before Kodak began manufacturing the film unit. That advice simply turned out to be wrong.

(b) The '789 Patent: Dye Developers

The '789 patent discloses a dye chemistry for color imaging which could serve as an alternative to the coupler chemistry of conventional color photography. At the risk of oversimplifying this complex technology, in the '789 system, during the development process, oxidation occurs and the dye developer splits off a dye molecule which transfers to the positive layer, helping create the final image. The part of the dye developer which is not oxidized remains with the negative layer.

Over the course of three years Mr. Carr reviewed more than 50 potential imaging chemistries for Kodak. Eventually, after working closely with Mr. Carr and performing tests he requested to make certain he understood how the chemistry worked, Kodak decided to use a sulfonamide process in the PR-10 film unit. In Mr. Carr's view, Kodak's chemistry avoided '789 because it involved a dye releaser that is ballasted and immobile. Furthermore, if Kodak's dye releasing chemistry was found to infringe '789, Mr. Carr believed that a prior art Canadian patent [*227] also infringed and would, therefore, constitute anticipation of and invalidate '789.

Mr. Carr reached these conclusions after reviewing the '789 file wrapper, prosecution history, and prior art, and working closely with Kodak engineers. The fact that Kodak engineers occasionally used the term "dye developer" in describing their process did not change Mr. Carr's view that significant differences existed between the two processes. Judge Zobel concluded, however, that Kodak's chemistry and the '789 chemistry were functionally identical and that '789 was valid in view of prior art. Although Mr. Carr's opinion turned out to be mistaken, Polaroid has shown no reason why Kodak should have considered the opinion unreasonable or unreliable in these circumstances.

(c) The '165-'262 Patents: Opacification/Format

One important element that makes instant photography possible is the creation of a "darkroom" that permits the film unit to develop outside the camera. In peel-apart units, the darkroom is created by surrounding the image-receiving layer with a structural sandwich that is discarded after development. In Polaroid's integral units, the darkroom is created by using transparent supports [*228] and an opacifying agent, contained in a pod, that is released after the film is exposed and before it exits the camera. This type of opacification also obviates the need for bulky reversing optics within the camera, as the film can be exposed through one side and viewed through the other.

The patent examiner initially rejected '165 for obviousness based on the prior art. Polaroid then amended the application and the patent issued. In reviewing the prior art and the '165-'262 patents, Mr. Carr agreed with the patent examiner's original assessment. Polaroid has not in any way shown that Mr. Carr's opinion was unreasonable or unreliable.

Polaroid makes much of the fact that at the same time it was prosecuting the '165 patent application, Harold E. Cole, one of Kodak's in-house patent counsel, filed a patent application for a substantially similar invention. Polaroid suggests that Kodak first deliberately withheld from Mr. Carr information about the Cole application, and then, after the '165 patent issued, manipulated Mr. Carr into issuing an opinion on '165 that would leave the Cole application intact.

Polaroid's arguments fail on all counts. Mr. Carr did not initially know of the [*229] Cole application because his duties involved patent clearance, not patent prosecution. When Mr. Carr did learn of Cole's application, he advised Kodak to abandon it both because it suffered from the same infirmities as '165 and because it forced Kodak into the inconsistent position of seeking a patent on the same invention Mr. Carr advised them was unpatentable. Kodak was reluctant to abandon the Cole application but, based on Mr. Carr's advice and after receiving a report from a separate task force which investigated the matter, eventually did so. If there can be found any attempt to manipulate Mr. Carr on these facts, clearly it failed. Mr. Carr's opinion and recommendations flatly contradicted Kodak's preferred course of action in this matter.

(d) The '540 Patent: Polyester Supports

The '540 patent discloses Dr. Land's solution to the problem of curling and distortion in the final photographic print. Rather than use water-permeable materials, which tended to dry unevenly, '540 shows the use of symmetrical supports made of impermeable polyester.

Using an impermeable material such as polyester for these film supports also created a "forever wet" system.

Noting the existence [*230] of the Kodak BIMAT process, dating back to 1951, which uses both symmetrical supports and a wet process, Mr. Carr advised Kodak that the only innovation contained in '540 was the use of polyester for the supports. Given that polyester was already being used in film and that DuPont was aggressively marketing its invention as a useful photographic material, Mr. Carr believed that '540 was invalid based on obviousness.

Judge Zobel, and later Professor Adelman, distinguished the BIMAT system and described the "forever wet" system as truly "inventive." Again, although Mr. Carr proved to be mistaken, Polaroid can point to no evidence that his opinion was unreasonable or unreliable.

(e) The '392 Patent: Rear Pick

Once Polaroid developed a fairly rigid integral film unit, the mechanics of advancing the film through the camera could be modified. Initially rejected by the patent examiner, the '392 patent discloses a rear pick which pushes the film unit out of the cassette after exposure. Kodak engineers saw Polaroid's SX-70 camera demonstrated in April and May 1972. The SX-70 film had no sprockets or perforations and this led the engineers to conclude that it was being pushed through [*231] the camera, not pulled, as was the usual method for film transport at the time. Without having access to an SX-70 camera, Kodak went to work developing its own "back-picking" camera.

Professor Adelman conceded that Kodak did not copy Polaroid's rear pick, but came upon the invention independently in mid-1972. Based on the prior art and differences in Kodak's pick and the route the film traversed before exiting the camera, Mr. Carr, agreeing with the patent examiner's initial decision, advised Kodak that '392 was obvious and invalid. Judge Zobel reached a different conclusion.

Polaroid belabors the fact that Mr. Carr's written clearance opinion on the camera patents, including the '392 patent, is dated April 28, 1976 -- two days after this suit was filed. To suggest that Kenyon & Kenyon could have prepared a 250-page report analyzing thirty-six different camera patents in just two days, all in response to this action, either overestimates Mr. Carr's abilities or underestimates the Court's common sense. In either case, the argument is specious.

(f) The '211 Patent: Light Shield Deflector

Before the opacifying agent bursts out of its pod as the film unit exits the camera, the [*232] photosensitive layer is susceptible to light piping within the camera. In

order to reduce the ambient light within the camera, Polaroid incorporated a light shield at the film exit. The placement of the shield necessitated bending the film as it left the camera. Polaroid unexpectedly discovered that upon bending, the "goo" within the pods, which develops and fixes the final image, coated the film more evenly and efficiently, and the problematic "tongue effect" in coating diminished significantly. Kodak and Polaroid engineers called this unexpected benefit "squaring the wavefront." More efficient spreading also meant that less "goo" could be used.

The '211 patent discloses bending both to avoid light piping and to push the film unit against bumps on the inside roof of the film cartridge in order to spread the "goo" more evenly. Mr. Carr reviewed the '211 claims and determined that squaring the wavefront was not one of the benefits claimed by the patent. He advised against using roof bumps in the Kodak EK-4 and EK-6 cameras and Kodak followed this advice. Because of the prior art and the failure of the patent to claim the coating benefits caused by the bend, Mr. Carr believed that '211 [*233] was invalid and not infringed. Judge Zobel disagreed, but there is no evidence that Mr. Carr's advice was unreasonable or that Kodak engineers should have known better.

The Totality of the Circumstances

Throughout the damages phase of the trial, Polaroid's counsel and Professor Adelman praised Mr. Carr, acknowledged his preeminence and expertise in the field of patent clearance, and never questioned his good faith in rendering the opinions and advice he gave Kodak over the years. Throughout Professor Adelman's testimony, however, two different themes have emerged. First, Professor Adelman stated, repeatedly and without qualification as to each of the patents in suit, that any "skilled attorney" would have recognized that the Polaroid patents were valid and that Kodak's products infringed. Second, Polaroid suggests that Mr. Carr's opinions were flawed because Kodak simply used him to ratify their knowing and willful infringement. The record clearly contradicts the first claim, as it shows a patent clearance process that could serve as a model for what the law requires. On the second claim, Polaroid has produced not a shred of evidence. The willfulness claim therefore fails.

[*234] The legal standard is clear. When a

potential infringer has actual notice of another's patent rights, he has an affirmative duty to exercise due care to determine whether or not he is infringing . . . Such affirmative duty includes, inter alia, the duty to seek and obtain competent legal advice from counsel before the initiation of any possible infringing activity . . .

[Underwater Devices, Inc. v. Morrison-Knudsen Co.](#), 717 F.2d 1380, 1389-90 (Fed. Cir. 1983) (emphasis omitted). The Federal Circuit has recognized that opinions of counsel can be manipulated and concluded that there can be "no per se rule that an opinion letter from patent counsel will necessarily preclude a finding of willful infringement, . . . nor is there a per se rule that the lack of such a letter necessarily requires a finding of willfulness." [Rite-Hite Corp. v. Kelley Co., Inc.](#), 819 F.2d 1120, 1125 (Fed. Cir. 1987) (quoting [Machinery Corp. of America v. Gullfiber AB](#), 774 F.2d 467, 472 (Fed. Cir. 1985)).

Not all opinions of counsel [*235] are created equal, certainly, and reliance on the opinion must be reasonable in the circumstances. Thus, in [Underwater Devices, Inc.](#), above, the Court determined that the infringer was not justified in relying on the opinion of in-house counsel when counsel did not "take the steps normally considered necessary and proper in preparing an opinion," such as reviewing the file history of the patent, and the opinion itself contained "only bald, conclusory and unsupported remarks regarding validity and infringement." 717 F.2d at 1390. Similarly, in [Bott v. Four Star Corp.](#), 807 F.2d 1567, 1572 (Fed. Cir. 1986), the Court found willfulness when the defendant had a long history of ignoring plaintiff's patents and counsel's oral opinion was entirely conclusory. In [Radio Steel & Mfg. Co. v. MTD Products, Inc.](#), 788 F.2d 1554, 1559 (Fed. Cir. 1986), however, the Court found no willful infringement in the totality of the circumstances even though patent counsel did not review the file wrapper or prior art before advising the defendant, orally, that the patent was invalid.

[*236] A defendant does not escape liability simply by obtaining the opinion of patent counsel. Courts have found willfulness when the infringer ignored advice of counsel and did not seek an updated opinion, [Central Soya Co. v. George A. Hormel & Co.](#), 723 F.2d 1573, 1577 (Fed. Cir. 1983), or when, inter alia, an opinion letter, conclusory in nature, was provided just two days before the defendant issued its first invoice for the infringing device. [Dickey-John Corp. v. International Tapetronics Corp.](#), 710 F.2d 329, 332-33 (7th Cir. 1983). In the totality of the circumstances surrounding the infringement in [Datascope Corp.](#), 879 F.2d at 828, the Court found defendant's reliance on counsel's conclusory opinion unreasonable when the opinion did not address the validity of plaintiff's patents or the doctrine of equivalents, and counsel did not consult the prosecution history of the patent.

The uncontroverted facts demonstrate that Kodak consulted Mr. Carr early and often as it developed its instant integral photography system. Mr. Carr examined Kodak's products, sometimes even requesting additional

tests in order to understand how the technology [*237] worked, and carefully studied any related Polaroid patents. The patent clearance process involved review of the file wrapper, the prosecution history, and the prior art. Of the ten patents and thirty-four different claims eventually considered by Judge Zobel, seven patents were found valid and twenty claims infringed. Altogether, Mr. Carr reviewed over 250 Polaroid and non-Polaroid patents (containing literally hundreds of claims) and rendered countless oral and 67 written opinions on the entire range of products Kodak developed as part of its instant photography program. In the totality of these circumstances, Mr. Carr's advice simply turned out to be incorrect concerning the relatively few patents eventually found infringed.

Polaroid would have the Court believe that Mr. Carr's advice was mistaken on these patents because Kodak manipulated the information he received in order to have a handy file of opinions which would protect the company from later charges of willful infringement. Nothing in the record supports this claim. This is hardly the case of "damn the torpedoes, full speed ahead," where the infringer's decisions were firmly settled before consulting patent counsel, [H.B. Fuller Co. v. National Starch & Chemical Corp.](#), 689 F. Supp. 923, 952 n.20 (D. Minn. 1988), [*238] nor was Kodak facing enormous "market pressure and urgency" that may have made reliance on counsel's inadequate opinion unreasonable. [Datascope Corp.](#), 879 F.2d at 828. Mr. Carr monitored the field for years, had access to Kodak records, reports, and personnel, and was placed under no financial constraints by Kodak. His opinions, "although later shown to be incorrect, contained significant, scientifically based objective factors to justify [defendant's] conclusion of no infringement." [Studiengesellschaft Kohle m.b. H. v. Dart Industries, Inc.](#), 862 F.2d 1564, 1579 (Fed. Cir. 1988) (emphasis deleted).

The theme is put succinctly in [Stickle](#), 716 F.2d at 1560 n.7:

Counterbalancing this consideration is that one who legitimately challenges the validity of a patent should not be overly penalized. Thus, a tension arises between these competing interests.

As commentators have advised:

On the one hand, the patent system requires a sufficiently severe penalty for infringement to protect the patent owner's exclusive position from pirates, [*239] but on the other hand, the public interest requires that there be a real opportunity to test the grants made by the Patent Office, without fear of a ruinous penalty for asserting a position taken in good faith.

R.A. White & L.F. Lynch, *Winning the Last Battle - The Recovery of Actual Damages in Patent Infringement*, Pat. L. Ann. 35, 36 (1970).

In conclusion, Polaroid has failed to show any deliberate or willful infringement of its patents by Kodak.

IX. ATTORNEYS' FEES

This section examines whether this is an "exceptional" case within the meaning of [35 U.S.C. § 285](#), thus permitting the award of attorneys' fees. The answer requires an overall assessment of Kodak's conduct, both during the infringement period and as a party to this litigation. Counsel have stipulated and agreed that if the Court decides to award Polaroid its reasonable attorneys' fees, \$ 48,000,000 would constitute the amount of those fees for the period 1976 through 1989.

As a general matter, counsel fees are not awarded in patent cases. The case must be truly extraordinary and requires

a [*240] finding of unfairness or bad faith in the conduct of the losing party, or some other equitable consideration of similar force, which makes it grossly unfair that the winner of the particular law suit be left to bear the burden of his counsel fees which prevailing litigants normally bear.

[Machinery Corp. of America](#), 774 F.2d at 471 (quoting [Park-In Theatres, Inc. v. Perkins](#), 190 F.2d 137, 142 (9th Cir. 1951)). An award of attorneys' fees under [35 U.S.C. § 285](#) serves as a deterrent to the "blatant, blind and willful infringement of valid patents," [Mathis v. Spears](#), 857 F.2d 749, 754 (Fed. Cir. 1988), as well as to "misconduct" at trial. [Rolls-Royce Ltd. v. GTE Valeron Corp.](#), 800 F.2d 1101, 1111 (Fed. Cir. 1986). As there is no evidence of willfulness, Polaroid has failed to meet the first test for an "exceptional" case under the statute.

Even in the absence of willful, intentional infringement, however, "misconduct during litigation, vexatious or unjustified litigation, or a frivolous suit" [*241] may warrant the award of attorneys' fees. [Rite-Hite Corp.](#), 819 F.2d at 1126 (quoting [Standard Oil Co. v. American Cyanamid Co.](#), 774 F.2d 448, 449 (Fed. Cir. 1985)). Under this second test, Polaroid has also failed to meet its burden.

First, I am familiar with the early pretrial stages of this case. The case was assigned to me initially and it was necessary to organize and oversee the complex and voluminous discovery. All counsel cooperated fully in that effort. The case was reassigned to Judge Zobel as the result of a random distribution of cases among newly appointed additional judges. Her estimation of counsels' performance is on the record. I believe it fair to say she

praised all counsel for their preparation, familiarity with and obedience to the rules, their technique, and their professionalism. (Liab. Tr. 8809-10). When this case was reassigned to me after Judge Zobel's recusal, counsel worked diligently in preparing for the damages trial.

Second, while the trial was vigorously contested at every turn, counsel were prompt, attentive, and civil. They played by the rules. Issues were not presented in bad faith; tactics were not vexatious [*242] or dilatory; sham defenses were not employed. Despite my constant remonstrances that this case would have been more expeditiously and effectively resolved in other than a judicial setting, the failure to do so cannot be attributed to counsel. Their performance overall was exemplary. My closing statement to counsel on "Day 96" was, "if it had to be done, counsel, I'm glad it was with this group of people."

Polaroid's request for attorneys' fees under [section 285](#) is accordingly denied.

X. PREJUDGMENT AND POST-JUDGMENT INTEREST

The final subject to discuss is the award of interest. The road is clearly marked. [Section 284](#) calls for "interest and costs as fixed by the court" and the Supreme Court has held that "prejudgment interest should be awarded under § 284 absent some justification for withholding such an award." [General Motors Corp. v. Devex Corp.](#), 461 U.S. 648, 657 (1983). Prejudgment interest serves to compensate the patent holder because its damages consist not only of the lost profits or royalty payments, but also of the lost use of the money between the [*243] time of infringement and the date of the judgment. *Id.*; [Nickson Industries, Inc. v. Rol Mfg. Co. Ltd.](#), 847 F.2d 795 (Fed. Cir. 1988). The court shall "determine the rate of interest . . . [and] whether it shall be simple or compounded." [Fromson v. Western Litho Plate & Supply Co.](#), 835 F.2d 1568, 1574 (Fed. Cir. 1988). The court has substantial discretion to determine the interest rate in patent infringement cases. [Gyromat Corp. v. Champion Spark Plug Corp.](#), 735 F.2d 549, 556-7 (Fed. Cir. 1984).

The parties agree that an award of prejudgment interest is appropriate here and differ only as to the proper rate and the method of computation. As usual, their differences are vast and complicated. Polaroid seeks an award of prejudgment interest at the prime rate compounded annually from 1976 to 1990. Elaborate computations were submitted through Mr. McNamara, Polaroid's accounting expert, and supported by Professor Roman Weil. In equally elaborate and complicated computations submitted by Professor Stewart Myers based on a cash flow analysis by Professor Robert Anthony, Kodak

urges an award based on short-term Treasury [*244] bill rates.

Interest rates vary widely depending on many factors. Indeed, at one point in this litigation, Polaroid argued for an interest award based on either the prime rate or United States Treasury securities. Commercial interest rates vary depending on the customer, time to maturity, costs incurred by the lenders, differing levels of risk, and costs of other services associated with the loan. While the institutional rates discussed here are not normally affected by those factors, even these rates are subject to wide variations. Between January 1976 and September 1990, the prime rate fluctuated from a low of 6.25% to a high of 20.50%. The average prime rate was slightly over eleven percent. The Treasury bill rate also varied widely during that period, from 4.44% to 17.83%. (DF 61,762). The average Treasury bill rate was slightly over nine percent.

The parties not only differ on the rate, but upon what to base the rate, namely, pre-tax or post-tax profits. Kodak argues that only an after-tax calculation will avoid an undeserved windfall to Polaroid. Because Polaroid would have had to pay taxes on any profits the company earned, it lost only the time value of money on [*245] after-tax amounts. Normally, this would not be an issue because, of course, judgments are taxed and Polaroid must pay taxes now. However, Kodak argues that because the tax rate now is lower than it was then, if Polaroid is awarded interest on pretax amounts, it will in effect be earning interest on money it never had to invest.

Kodak's argument is an appealing one, but I reject it in this case for a number of reasons. First, I do not believe it sound to calculate interest to be paid now based on tax rates in effect at the time the injury was sustained. That approach lends itself to unbounded speculation and uncertainty and can result in a potential windfall to either party. I have no basis upon which to decide how Polaroid could have sheltered that income and any effort to learn would have complicated this area unnecessarily.

Second, an award based on after-tax amounts could result in double taxation. Any award will certainly be scrutinized by tax officials at both the state and federal levels who will determine the correctness and applicability of the rate employed. Third, even if I were to accept the windfall argument, I have taken it into consideration in setting [*246] the rate and, in my judgment, avoided the uncertainty of the need to "gross up" the award, avoided excess compensation, and arrived at a fair damages award. Finally, I have not been given any convincing precedent on this issue.

Turning to the record, it is a sparse one and unavailing to me in attempting to determine how Polaroid would have successfully invested additional profits. There is no

evidence that the company borrowed money at any particular interest rate or that it was in dire financial condition and forced into the borrower's market at high rates during the infringement period. There is no evidence of any corporate policy to re-invest a certain percentage, or to purchase certain interest-bearing securities, or to contribute to employee or stockholder profit-sharing plans.

After consideration of all the factors and having in mind that the goal to be achieved is fair and adequate compensation, I conclude that an award of prejudgment interest should be based on the Treasury bill rate for the period of April 1976 to this date, compounded annually. See Appendix IV.

Post-judgment [*247] interest is to be computed daily from the entry of judgment to the date of payment, compounded annually pursuant to [28 U.S.C. § 1961\(a\)\(b\)](#).

XI. CONCLUSIONS AND AWARD

1. Kodak's infringement of any one or more of the patents in suit was not willful and deliberate.

2. In accordance with [35 U.S.C. § 284](#), the amount of damages adequate to compensate Polaroid for Kodak's

infringement is \$ 454,205,801.00. The prejudgment and postjudgment interest award to date is \$ 455,251,766.00. The total award is \$ 909,457,567.00.

3. Costs will not be taxed against either party.

4. Polaroid is not entitled to its reasonable attorneys' fees because this is not an "exceptional case" within the meaning of [35 U.S.C. § 285](#).

Judgment will issue in accordance with this award.

So ordered.

ORDER OF JUDGMENT

In accordance with the Opinion issued this day, it is hereby ORDERED that judgment be entered for the plaintiff, Polaroid Corporation, in the amount of \$ 909,457,567.00.

[SEE APPENDIX 1 IN ORIGINAL]

[SEE APPENDIX 2 IN ORIGINAL]

[SEE APPENDIX 3 IN ORIGINAL]

[SEE APPENDIX 4 IN ORIGINAL]